FACT BOOK

DECEMBER 1977

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NAVAL RESEARCH LABORATORY
Washington, D.C. 20375

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This document has been prepared as

a reference source of factual information

about the Naval Research Laboratory.

December 31, 1977

The Naval Research Laboratory has a continuing need for physical scientists, mathematicians, engineers, and supporting personnel. Vacancies are filled without regard to race, creed, color, sex, or national origin. Information concerning current vacancies will be gladly furnished upon request. Address all such inquiries to the Civilian Personnel Office (Code 1800), Naval Research Laboratory, Washington, D.C. 20375.

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Aerial view of the Naval Research Laboratory main site

Mission . . .

To conduct a broadly based multidisciplinary program of scientific research and advanced technological development directed toward new and improved materials, equipment, techniques, systems, and related operational procedures for the Navy. In fulfillment of this mission, the Naval Research Laboratory:

(a) Initiates and conducts scientific research of a basic and long-range nature in scientific areas of special interest to the Navy.

(b) Conducts exploratory and advanced technological development deriving from or appropriate to the scientific program areas.

(c) Within areas of technological expertise, develops prototype systems applicable to specific projects.

(d) Performs scientific research and development for other Naval commands and, where specially qualified, for other agencies of the Department of Defense and, in defense-related efforts, for other Government agencies.

(e) Upon request from appropriate Naval commands, assumes responsibility as the Navy's principal R&D center in areas of unique professional competence.

(f) Provides to the Navy and its contractors standardized techniques and procedures for measurements and the accurate calibration of standard instruments in areas of special Navy needs.

(g) Furnishes scientific consultative services for the Navy and, where specially qualified, for other agencies of the Department of Defense and, in defense-related efforts, for other Government agencies.

(h) Provides to the Navy determinations of performance characteristics of developmental and prototype devices through limited engineering test and evaluation services.

Introduction to NRL . . .

The Naval Research Laboratory (NRL) was officially established on July 2, 1923, as the Naval Experimental and Research Laboratory. NRL still occupies its original site on the banks of the Potomac River in the southwest sector of Washington, D.C. Over the past 54 years, the facility has grown from a modest beginning of five buildings and a few hand-picked scientists representing two major research areas--radio and underwater sound--to its present status as the "Corporate Laboratory of the Navy." Current resources include a Main Laboratory expanded to some 52.2 hectares (129 acres), about 20 field sites, more than 400 buildings and structures, and a work force in the neighborhood of 3600.

The Laboratory exists today as it was originally conceived more than a half century ago--that is, with the overall management under the direction of a naval officer, designated the Commanding Officer; and with the scientific research performed under the guidance of a civilian, the Director of Research. The organization chart shows the internal structure of the Laboratory to be divided into three main areas: the Office of the Commanding Officer with its staff functions; the Support Services Department with its staff functions and five supporting divisions; and the Research Department with its four major areas of research--each headed by an Associate Director of Research--comprising 16 research divisions.

Current Research . . .

The following 14 headings represent broad fields of NRL research. Underneath each are more specific topics that are being investigated for the benefit of the Navy and other sponsoring organizations. Some details of this work are given in NRL's Review, published annually, and in the Report of NRL Progress, published monthly. More specific details are published in reports on individual projects provided to sponsors and presented when feasible as papers for professional societies or their journals.

Communications
- Satellite Communications
- Secure Communications
- Computer Architecture
- Communication Intercept and Jamming

Countermeasures
- Decoys (RF and IR)
- Repeaters
- Laser Countermeasures
- Optical Guidance Systems
- Jammers

Device Technology
- Integrated Optics
- Radiation-Hardened Electronics
- Microelectronics

Directed Energy Devices
- High-Energy Lasers
- Chemical Laser
- Laser Propagation
- Radiation Damage
- High-Power Microwave Sources
- Charged-Particle Devices

Energy Conversion
- Kinetics of Combustion Processes
- Electrochemical Power Sources
- Fusion

Environmental Effects
- Oceanography
- Underwater Acoustic Propagation
- Meteorological Effects on Electro-optical Systems
- Air Quality in Confined Spaces
- Extravisible Optical and Radio Background in Space.
- Solar Activity
- Ionospheric Behavior

Hydrodynamics
- Low-Drag Bodies
- Numerical Simulation of Naval Platforms
- Magnetohydrodynamics Code Generation

Materials
- Electronic Properties
- Special Purpose Polymers
- Failure Criteria
- High-Flux Environments
- High-Temperature Environments

Navigation
- Clock Development
- Navigation Technology Satellite - 2
- Global Positioning System (GPS) Support

Sensor Systems
- Acoustic & Electromagnetic COMINT, ELINT & ESM
- Focal Plane Imagers
- Microwave Remote Sensing

Sonar Standards
- Calibration
- Secondary Standards

Surveillance Systems
- Properties of the Medium
- Target Characteristics
- Sensors

Undersea Technology
- Autonomous Vehicles
- Deep Ocean Search
- Bathymetric Technology
- Anechoic Coatings

Weapons Guidance
- Global Positioning System (GPS) Guidance
- Optimized Optical Seeker
- Radar Guidance

Recent Accomplishments in Science and Technology . . .

Acoustics

Developed and validated a normal-mode propagation program to predict sonar performance in acoustically shallow water.

Communications

Delivered a Fleet Satellite Communications (FLTSATCOM) Onboard Processor space qualification model.

Selected the linear predictive filter for the Army-Navy-Air Force Narrowband Terminal.

Developed technology used by Army/Navy Committee to select commercial instruction set for new military computers.

Countermeasures

Developed the Navy's Ultraviolet Technology Program.

Developed the infrared countermeasures technique and showed it to be effective against a broad class of electrooptically guided, air-to-air missile scanners.

Developed advanced radar-reflective materials and deployment methods for ship and aircraft protection.

Designed lightweight electronic countermeasures payload for ship-deployable remotely piloted vehicles.

Device Technology

Radiation-hardened the FLTSATCOM System Onboard Processor.

Explained the intrinsic optical losses in laser optics at room temperature in terms of the thermodynamic properties at the glass transition temperature.

Produced first ion-implanted indium phosphide field-effect transistor.

Developed single TRAPATT which produced 63 W with 30 to 35% efficiency at 2 GHz by using 50-μs pulses--highest efficiency achieved with this pulse width.

Developed and tested a new type of thermionic dispenser cathode having controlled porosity surface produced by photolithography techniques.

Developed a new low-energy electron reflection (LEER) technique which separates semiconductor wall function changes into surface dipole effects and band structure effects.

Completed a comprehensive characterization of neutron irradiation effects in charge-coupled devices.

Developed and demonstrated the first rugged single-mode optical fiber-to-integrated optical circuit couplet.

Demonstrated the first microoptic branching wave-guide modulator.

Directed Energy Devices

Measured the thermal coupling coefficients for a variety of metals and ceramics subjected to high-powered continuous-wave and pulsed infrared lasers.

Achieved pulses of 4 GW of power at S band with a 30% device efficiency by using a new experimental device with relativistic electron beams in a magnetron configuration.

Completed and put into operation a new high-current electron-beam accelerator based on a novel auto-accelerator concept. The concept promises major reduction in size and weight for high-current, high-voltage electron accelerators.

Developed UV-preionized rare-gas-halide lasers in XeF, KrF, and AtF.

Demonstrated 1-μs pulses in electron-beam pumped rare-gas-halide lasers.

Measured and calculated the first long-path high-resolution ($0.08\ cm^{-1}$) absorption spectrum of the atmosphere.

Operated a gas filter correlation spectrometer as a measure of total water content along a transmission path.

Energy Conversion

Developed a laboratory combustion system for measuring combustion species, efficiencies, and temperatures as a prelude to a full-scale jet engine testing facility.

Environment

Mapped soft x-ray background and detected gamma-ray sources in space.

Determined sources of atmospheric, interplanetary, cometary, and astronomical ultraviolet emission.

Achieved precise time transfer and detailed mapping of radio sources with VLBI (very long baseline interferometry).

Demonstrated response of geomagnetic fluctuations to solar coronal events.

Habitability

Developed a central atmosphere monitor system which allows submarine crews to maintain their ambient atmosphere reliably; it is being installed in all nuclear-powered submarines.

Hydrodynamics

Developed criteria and efficiency design methodology for optimum laminar flow body profiles.

Developed computational methods to predict accurately the flow-induced motions of mooring stays.

Developed a 2-D triangular mesh hydrocode which makes it possible to handle the problem of breaking surface waves in a practical numerical simulation of the passage of a semisubmerged object through the water.

Developed an improved magnetohydrodynamics code to predict effects of high-altitude nuclear bursts.

Developed and is now testing a multidimensional, "slow flow" algorithm that retains fluid compressibility effects without sound-speed computational limitations.

Lasers

Showed that a glass laser, suitable for demonstrating the feasibility of laser-initiated fusion, can now be built at about one-third the cost of the previous best design; this laser has much higher pulse repetition rates and makes lower demands on the capacity of the optics industry.

Developed a high-efficiency repetitive-pulse 16-μm CO_2 laser, key element for laser separation of uranium isotopes.

Produced a laser-induced separation of rare earth mixtures in the liquid phase; major implications occur in management processes for nuclear waste.

Materials

Developed fluorepoxy and fluorourethane polymers as coatings for Navy ships and vehicles.

Demonstrated that addition of very small quantities of saligenin to high-energy explosives results in significant desensitization.

Used ion implantation to harden infrared window materials against effects of high-energy lasers.

Used laser welding to increase considerably the fracture toughness of welds.

Developed a new high-temperature ferritic alloy for use in a new liquid-metal fast breeder reactor.

Developed ceramic fractography to determine the causes of failure in acoustic source transducers, ceramic turbine materials, and MgF_2 IR dome materials.

Navigation

Will deliver engineering development model cesium-beam frequency standards, based on the Navigation Technology Satellite-2 (NTS-2) flight prototypes, to the Air Force contractor in 1977 for flight on the GPS satellites.

Will deliver competitive advanced development model hydrogen maser frequency standards in late 1977 for evaluation as flight candidates for advanced GPS satellites.

Launched NTS-2 in mid-August 1977.

Ocean Thermodynamics

Obtained the first near real-time, three-dimensional description of the thermal variability of the upper kilometer of the ocean.

Sonar Standards

Developed and installed computer-controlled high-power pulsed-emittance measurement system for calibration and evaluation of underwater transducers.

Designed and evaluated a longitudinal resonance magnetostrictive transducer by using an alloy of iron and rare earth.

Surveillance Systems

Demonstrated that HF over-the-horizon (OTH) radar can measure ocean wave height and delineate storms.

Developed 90-GHz remote imaging system.

Weapons Guidance

Developed a novel concept for hardening TV guided missiles against electrooptical countermeasures.

Patents and Papers

In breaking new ground during many of these projects, NRL scientists and engineers developed many improved devices and techniques. For such innovations, the Laboratory was awarded 67 patents during 1976. Since its founding, NRL has earned 2590 patents.

The practical results of work on the projects listed above and on others that are undertaken in response to sponsor requests are made known and available not only to various Navy units, but also to the Army, Air Force, the Defense Research Projects Agency, the Nuclear Regulatory Commission, and other Federal organizations. Moreover, NRL's research is reported to the scientific community in hundreds of presentations, journal articles, and reports every year. During the year ending December 31, 1976, NRL staff members delivered approximately 2000 presentations and published more than 1300 reports and other kinds of publications at NRL and in periodicals and books.

Major Facilities and Capabilities

Listed by Divisions and Specialized Units

Research Department

Research Computation Center

- Texas Instruments Advanced Scientific Computer, an extremely large, fast, and powerful data processing system
- Off-Line CRT Plotter Facility
- DEC-10 Timesharing Computer
- Analog-to-Digital Data Translation Facility

Electronics Technology Division

- Silicon Integrated Circuit Processing Facility
- Microscopes and electrooptical devices
- Crystal-growing facilities
- A variety of electronic testing and analysis facilities

Radar Division

- MADRE Over-the-Horizon Radar
- Radar Area Measurement System
- Airborne Multifrequency Microwave Radiometer
- Air-to-Ground Simulation Facility
- SEA-ECHO HF Radar Facility (San Clemente, Calif.)
- Interpretation Facility for Satellite Aperture Radar (SAR)
- Radar Research and Development Activity
- Roll and Pitch Platform

Communications Sciences Division

- IFF Ground Station
- Microwave Space Research Facility
- Satellite Communications Antenna Facility
- Computer Architecture Research Facility
- HF Modem and Channel Simulation Facility
- SIGINT Analysis Facility
- Narrow-Band Special Processive Development and Simulation Facility

Optical Sciences Division

- Optical Warfare Laboratory (including CYCLOPS)
- Infrared Mobile Optical Radiation Laboratory
- Micrometeorological Equipment Barge

Tactical Electronic Warfare Division

- Mobile Infrared Signature Measuring and Recording Facility
- Hybrid RF/IR Missile Seeker Simulation Facility
- Central Target Simulation Facility for developing, testing and evaluating EW systems and techniques (under construction)

Laboratory for Structure of Matter

- Two x-ray diffractometers
- Electron diffractometer

Radiological and Environmental Protection Staff

- Neutron Irradiation Facility
- X-Ray and Gamma-Ray Irradiation Facility

Chemistry Division

- Analytical Chemistry Facility
- Laser Chemistry Facility
- Surface Analysis and Lubrication Research Facility
- Paint and Coating Facility
- Filament Winding Facility
- Mechanical Characterization of Polymers Facility
- Alternate and Petroleum-Derived Fuels Facility
- Combustion Research Facilities
- Facilities for research in colloids, adhesion, aerosols and filters, gas absorption, plastics, and other aspects of chemistry

Engineering Materials Division

- High-Level Radiation Laboratory
- Computerized Mechanical Test Laboratory
- Electron microscopes and other microanalytical equipment

Material Sciences Division

- High-Field Magnet Facility
- High-pressure, low-temperature facilities
- Laser Hardening/Processing Test Facility (expected to be on-line in January 1978)
- Extensive facilites for synthesis and characterization of optical glass compositions and for the fabrication of optical fibers

Radiation Technology Division

- 1.93-m (6.3-ft), 75-MeV Sector-Focusing Cyclotron
- 60-MeV Linear Electron Accelerator (Linac)
- 5-MeV Electrostatic Charged Particle Accelerator (Van de Graaff)
- 2-MeV Van de Graaff Accelerator

Laboratory for Cosmic Ray Physics

- Cosmic Ray Physics Laboratory
- Nuclear Emulsion Processing Facility

Spacecraft Technology Center

- Anechoic Chamber (for satellite checkout)
- Thermal Vacuum Chamber
- Two smaller thermal vacuum chambers
- Two miscellaneous vacuum chambers
- Spin Balance Facility
- Acoustics Facility (for testing)
- Vibration Facility
- Clean-room facilities

Space Science Division

- E. O. Hulburt Center for Space Research
- Radio telescope with 25.6-m (84-ft) antenna at Maryland Point
- Other antennas for radio astronomy

Plasma Physics Division

- Gamble I and II High-Voltage Pulsed Power Generators
- PHAROS II Two-Beam Neodymium-Glass Laser and Target Facility

Space Systems Division

- Hypervelocity Gun (listed under Chesapeake Bay Division)
- Two other high-power guns for ballistics research
- Navigation Technology Satellite tracking stations
- Digital Optical Processing Laboratory

Acoustics Division

- Large tank (a former pool nuclear reactor) instrumented for investigating target acoustic echo characteristics
- Tank 9.1 m (30 ft) in diameter by 6.7-m (22-ft) deep for precise studies of transducer and other underwater devices
- USNS HAYES. The Division is a major user of this oceanographic ship, which is listed later under "Mobile Platforms."

Underwater Sound Reference Division

- 2.8-hectare (7-acre) lake with a large pier and instrumentation for underwater acoustic studies
- Anechoic tank for simulating ocean depths up to 700 m (2297 ft)
- Smaller pressure vessels for simulating depths to 7000 m (22,966 ft)
- Field station at Bugg Spring with floating platform and instrumentation for acoustic measurements

Ocean Technology Division

- Shock and Vibration Laboratory Wave Channel: a 30-m (98-ft) tunnel with fan and mechanical wave-maker instrumented for generating and studying waves and their effects

Support Services Department

Engineering Services Division

- Mechanical, electronic, and project engineering and design
- Manual and computer-aided drafting
- Shops for machining, sheet metal, welding, casting, plating, plastics, printed circuits, electronic assembly, and other fabrication services
- A wide variety of testing and repair capabilities
- Vendor liaison and surveillance

Supply Division

- Procurement, storage, distribution, and disposal of materials and equipment required by the Research Department

Public Works Division

- Construction, engineering, repair, and other services to maintain and improve NRL's physical facilities

Technical Information Division

- Editorial, graphic, photographic, printing, and exhibit services
- Technical Library

Chesapeake Bay Division (CBD)

- Radar Experimental Test Site, which includes a variety of radars; ancillary equipment for test and evaluation of equipment, concepts and techniques; and over-water ranges
- Radio telescope with 45.7-m (150-ft) antenna dish
- Communications facilities for transmission to and from land, sea, and air
- Hypervelocity gun for ballistics research
- Ship Motion Simulator with 11-metric-ton (12-ton) payload capacity
- Fire Test Facility for fire extinguishment research

Mobile Research Platforms

Oceanographic ship USNS HAYES, a 3475-metric ton catamaran
Two-engine S-2D "Tracker" aircraft
Two four-engine turboprop P-3A "Orions"
Four-engine EC-121K Super Constellation instrumented for electronic warfare research

Military and Civilian Personnel

Military Personnel Attached to NRL as of October 1, 1977

Officers	Authorized	On Board
Captain	4	4
Commander	9	9
Lieutenant Commander	8	4
Lieutenant	6	6
Lieutenant (Junior Grade)	1	0
Ensign	0	3
Warrant Officer	4	3
Total	32	30
Enlisted	114	103

Full-Time Permanent Civilians on Board as of September 16, 1977

10 USC 1581 (formerly Public Law 313)		22
Classification Act (GS)		2621
Scientific and Professional	1370	
Technical Supporting	637	
General Administrative & Clerical	614	
Wage Board		636
General Wage Service (WG)	529	
Apprentices (WB)	22	
Printing & Lithographic Service (WI)	15	
Supervisory General Wage Service (WS)	48	
Supervisory, Planners & Estimators (WN)	2	
Planners, Estimators, etc.	18	
Leaders (WL)	2	
Total		3279

Annual Civilian Turnover Rate (percent)

	1973*	1974	1975	1976	1977
Research Department	7.5	5.9	5.9	5.9	7.5
Nonresearch Areas	12.0	11.3	10.2	14.0	14.3
Entire Laboratory	9.4	8.2	7.8	9.2	10.1

*Cost-of-living pension increases influenced the number of retirees

Highest Academic Degrees Held by Permanent Employees
(As of September 16, 1977)

Bachelors	583
Masters	368
Doctorates	556

Fiscal Information

NRL FUNDING BY MAJOR SPONSOR

Sponsor	FY 1976 Actual Millions of Dollars	FY 1976 Percent	FY 1977 Budget Millions of Dollars	FY 1977 Percent
R&D Program				
ONR	37.6	21.8	39.8	21.3
SEA	12.3	7.1	13.3	7.1
ELEX	68.6	39.7	40.8	21.9
AIR	13.1	7.6	9.1	4.9
CNM	0.3	0.2	12.5	6.7
Other Navy	15.5	8.9	45.8	24.5
Total Navy	147.4	85.3	161.3	86.4
Other DOD	10.1	5.8	11.4	6.1
Non-DOD	10.2	5.9	10.4	5.6
Total R&D Program	167.7	97.0	183.5	98.1
Non-R&D Program	4.2	2.4	1.9	1.0
Capital Improvement	1.0	0.6	1.7	0.9
Total Funds	172.9	100.0	186.7	100.0

BUDGET BY COST ELEMENT (Millions of Dollars)

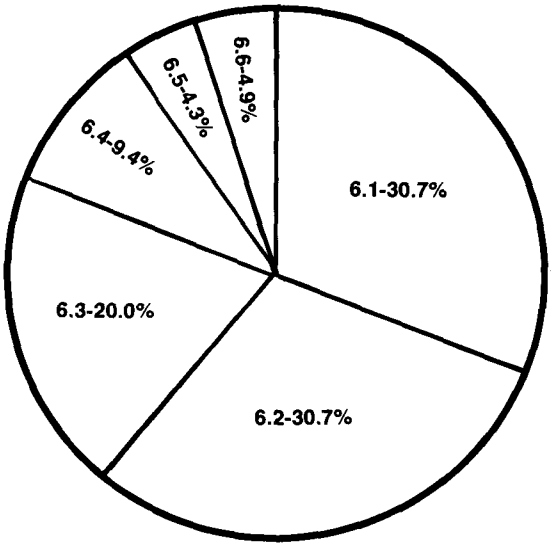
Purpose	FY 1976	FY 1977
Materials, supplies	15.6	16.8
Salaries and wages	85.8	87.8
Contractural services	63.1	72.0
Other costs	8.4	10.1
TOTAL	172.9	186.7

CAPITAL PROPERTY

Type or Class	Value as of 31 August 1977 ($K)
Class 1 (Land)	$ 353.
Class 2 (Buildings and improvements)	83,575.
Class 3 (Equipment over 1.0K)	30,902.
Class 4 (Industrial production equipment	19,001.
TOTAL CAPITAL PROPERTY	$133,831.

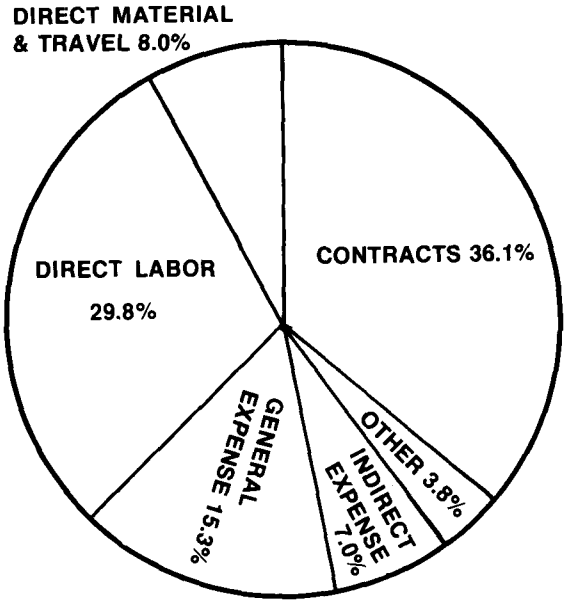
NRL

RDT&E,N FUNDS BY CATEGORY
PLANNED OBLIGATIONS FY-1977

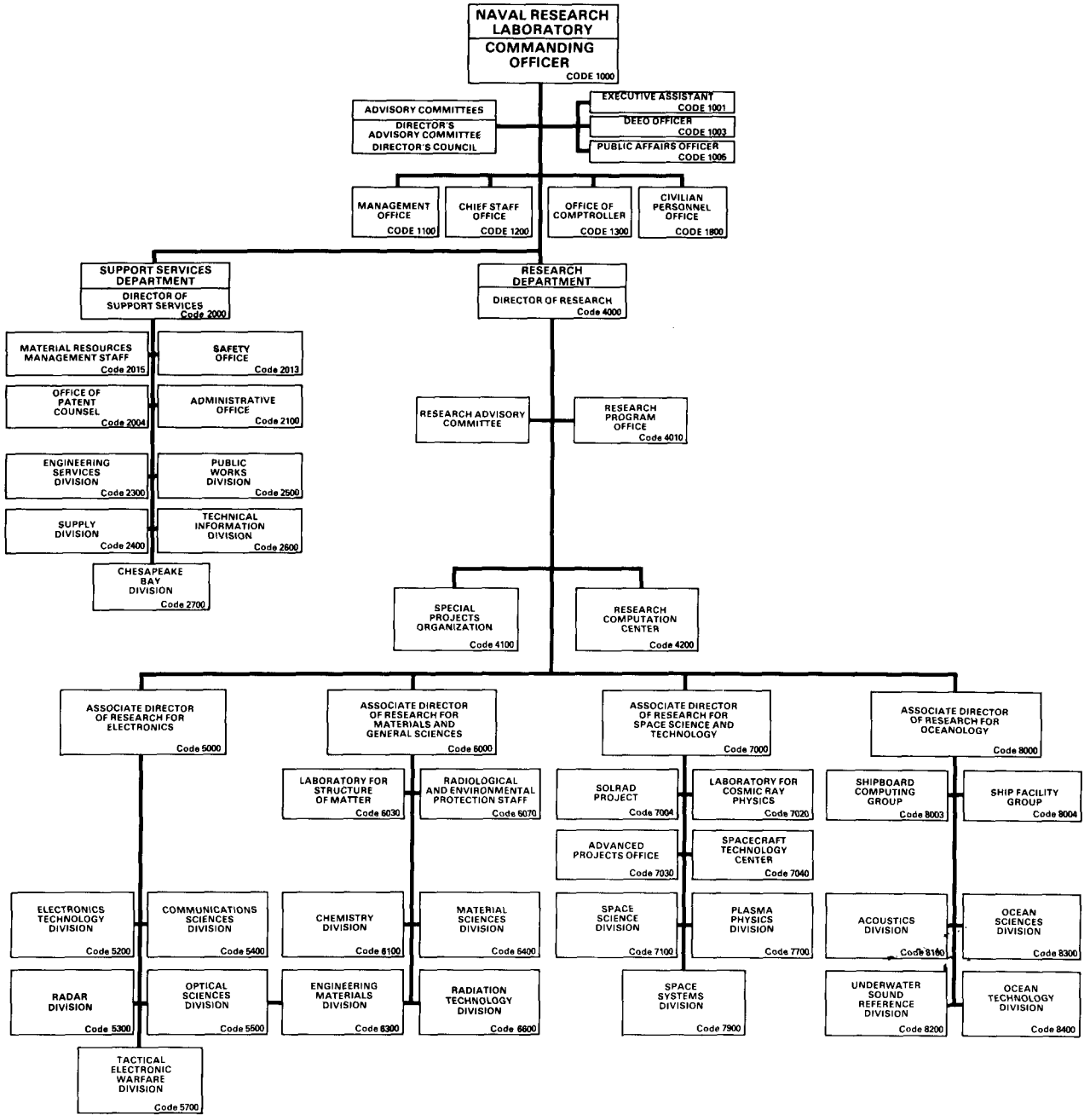


	(MILLIONS)
6.1 RESEARCH	$ 37.3
6.2 EXPLORATORY DEVELOPMENT	37.3
6.3 ADVANCED DEVELOPMENT	24.4
6.4 ENGINEERING DEVELOPMENT	11.5
6.5 MANAGEMENT & SUPPORT	5.2
6.6 OPERATIONAL SYSTEMS DEVEL.	6.0
TOTAL	$121.7

DISTRIBUTION OF R&D COSTS
FY-1977 PLAN



	(MILLIONS)
DIRECT LABOR	$ 54.5
DIRECT MATERIAL & TRAVEL	$ 14.7
CONTRACTS	$ 66.1
OTHER	$ 7.0
APPLIED OVERHEAD:	
INDIRECT EXPENSE	$ 12.8
GENERAL EXPENSE	$ 28.0
TOTAL	$183.1


NAVAL RESEARCH LABORATORY
COMMANDING OFFICER
CODE 1000
ADVISORY COMMITTEES
DIRECTOR'S ADVISORY COMMITTEE
DIRECTOR'S COUNCIL
EXECUTIVE ASSISTANT
CODE 1001
DEEO OFFICER
CODE 1003
PUBLIC AFFAIRS OFFICER
CODE 1005
MANAGEMENT OFFICE
CODE 1100
CHIEF STAFF OFFICE
CODE 1200
OFFICE OF COMPTROLLER
CODE 1300
CIVILIAN PERSONNEL OFFICE
CODE 1800
SUPPORT SERVICES DEPARTMENT
DIRECTOR OF SUPPORT SERVICES
Code 2000
MATERIAL RESOURCES MANAGEMENT STAFF
Code 2015
SAFETY OFFICE
Code 2013
OFFICE OF PATENT COUNSEL
Code 2004
ADMINISTRATIVE OFFICE
Code 2100
ENGINEERING SERVICES DIVISION
Code 2300
PUBLIC WORKS DIVISION
Code 2500
SUPPLY DIVISION
Code 2400
TECHNICAL INFORMATION DIVISION
Code 2600
CHESAPEAKE BAY DIVISION
Code 2700
RESEARCH DEPARTMENT
DIRECTOR OF RESEARCH
Code 4000
RESEARCH ADVISORY COMMITTEE
RESEARCH PROGRAM OFFICE
Code 4010
SPECIAL PROJECTS ORGANIZATION
Code 4100
RESEARCH COMPUTATION CENTER
Code 4200
ASSOCIATE DIRECTOR OF RESEARCH FOR ELECTRONICS
Code 5000
ASSOCIATE DIRECTOR OF RESEARCH FOR MATERIALS AND GENERAL SCIENCES
Code 6000
ASSOCIATE DIRECTOR OF RESEARCH FOR SPACE SCIENCE AND TECHNOLOGY
Code 7000
ASSOCIATE DIRECTOR OF RESEARCH FOR OCEANOLOGY
Code 8000
LABORATORY FOR STRUCTURE OF MATTER
Code 6030
RADIOLOGICAL AND ENVIRONMENTAL PROTECTION STAFF
Code 6070
SOLRAD PROJECT
Code 7004
LABORATORY FOR COSMIC RAY PHYSICS
Code 7020
SHIPBOARD COMPUTING GROUP
Code 8003
SHIP FACILITY GROUP
Code 8004
ADVANCED PROJECTS OFFICE
Code 7030
SPACECRAFT TECHNOLOGY CENTER
Code 7040
ELECTRONICS TECHNOLOGY DIVISION
Code 5200
COMMUNICATIONS SCIENCES DIVISION
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Code 6400
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Code 7100
PLASMA PHYSICS DIVISION
Code 7700
ACOUSTICS DIVISION
Code 8160
OCEAN SCIENCES DIVISION
Code 8300
RADAR DIVISION
Code 5300
OPTICAL SCIENCES DIVISION
Code 5500
ENGINEERING MATERIALS DIVISION
Code 6300
RADIATION TECHNOLOGY DIVISION
Code 6600
SPACE SYSTEMS DIVISION
Code 7900
UNDERWATER SOUND REFERENCE DIVISION
Code 8200
OCEAN TECHNOLOGY DIVISION
Code 8400
TACTICAL ELECTRONIC WARFARE DIVISION
Code 5700

NRL Sites and Facilities

Station and Location	Acreage			Value	Class I & II Plant Account Buildings and Structures
	Fee Title	Easement or Purchase	Permit or Lease		
District of Columbia					
Naval Research Laboratory	129.23		1.29	$70,131,468	158
Cyclotron Building Site Bolling AFB			5.24	3,883,846	1
Virginia					
Radio Research Site, Coast Guard Radio Station, Alex.			55.40		
Atmospheric Monitoring Facility, Big Meadows Util. Area, Shenandoah Nat'l Park			NA[1]		
Maryland					
NRL Flight Support Detachment, NAS Patuxent River			[2]		
[3]Chesapeake Bay Div. Chesapeake Beach	167.90			10,684,948	183
Multiple Research Site, Tilghman Is.	2.00			110,662	12
Dock Facility, Fishing Ck., Ches. Bay			0.60	18,533	5
Theodolite Station, North Beach			0.29	800	1
Optics Research Platform in Ches. Bay			0.23	1,500	2
Stabilized Platform, Ches. Bay				21,400	1
Foghorn Platform, Ches. Bay Bridge			NA		
Research Gondola, Ches. Bay Bridge			NA		
NRL Waldorf Annex, Waldorf	23.94	35.16		1,291,301	37
Radio Astronomy Observatory, Md. Pt.	24.30		197.88	265,988	13

Station and Location	Acreage			Value	Class I & II Plant Account Buildings and Structures
	Fee Title	Easement or Purchase	Permit or Lease		
Radio Antenna Range, USAF Receiver Site, Brandywine			22.98		
Free Space Antenna Range, Pomonkey	14.12	28.40		811,818	13
Satellite Tracking Facility, Blossom Point			135.57		
California					
Naval Construction Bn., Port Hueneme					
NRL Field Site, Point Mugu					
Satellite Tracking Facility, Vandenburg, AFB					
Puerto Rico					
Naval Station, Roosevelt Roads					
Florida					
[3]Underwater Sound Reference Div., Orlando	10.46			1,269,830	31
[3]USRD, Leesburg Facility, Bugg Spring			6.92	255,012	9
Marine Corrosion Lab., Key West					
Totals:	371.95	63.56	426.40	88,747,106	467

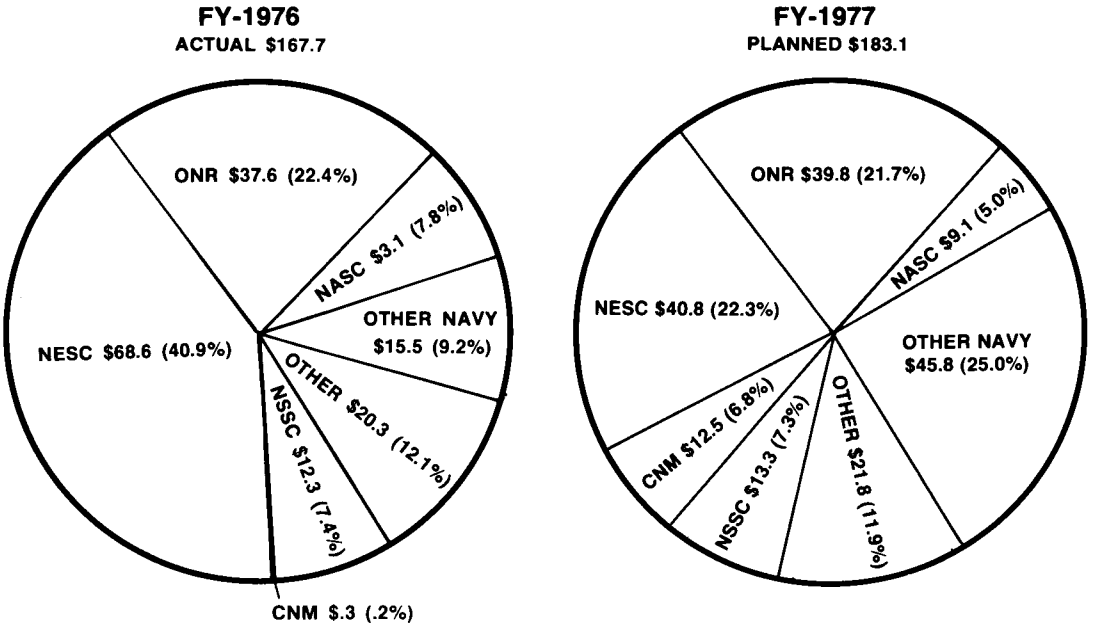
[1] NA (not applicable)--Indicates an insignificant area, frequently just a location for instruments.

[2] Site or equipment used by NRL under an intraservice (Navy) or interservice agreement.

[3] Also included in list of "Major Facilities and Capabilities."

NRL

SOURCES OF R&D FUNDS
(IN MILLIONS)



ONR – OFFICE OF NAVAL RESEARCH
NESC – NAVAL ELECTRONIC SYSTEMS COMMAND
NSSC – NAVAL SEA SYSTEMS COMMAND
CNM – CHIEF OF NAVAL MATERIAL
NASC – NAVAL AIR SYSTEMS COMMAND

R&D PROGRAM FUNDS BY TYPE (IN MILLIONS)

TYPE OR PURPOSE OF FUNDS	FY 1976		FY 1977	
	ACTUAL	PERCENT	PLANNED	PERCENT
RDT&E,N				
6.1 RESEARCH	$ 31.7	18.9	$ 37.3	20.4%
6.2 EXPLORATORY DEVELOPMENT	25.8	15.4	37.3	20.4
6.3 ADVANCED DEVELOPMENT	28.0	16.7	24.4	13.3
6.4 ENGINEERING DEVELOPMENT	10.1	6.0	11.5	6.3
6.5 MANAGEMENT & SUPPORT	3.1	1.8	5.2	2.8
6.6 OPERATIONAL SYSTEMS DEVEL.	9.2	5.5	6.0	3.3
SUBTOTAL	$107.9	64.3	$121.7	66.5
OPN	8.9	5.3	1.8	1.0
O&MN	24.1	14.4	32.8	17.9
OTHER	26.8	16.0	26.8	14.6
TOTAL	$167.7	100.0	$183.1	100.0

Office of the Commanding Officer

The Commanding Officer of the Naval Research Laboratory is responsible for the overall management of the Laboratory; he exercises the usual functions of command including compliance with legal and regulatory requirements and liaison with other military activities, as well as general supervision of the timeliness and effectiveness of the technical work and of the support services.

The Directors of the Laboratory's two major departments, Research and Support Services, report to the Commanding Officer, and he is further assisted by the Laboratory's major staff offices: the Chief Staff Officer, the Comptroller, the Civilian Personnel Officer, the Management Officer, the Deputy Equal Employment Officer, the Public Affairs Officer, and an Executive Assistant.

Commanding Officer
Naval Research Laboratory

Captain L. M. Noel

CAPTAIN L.M. NOEL [redacted], [redacted] He attended Cornell University in Ithaca, New York, before entering the U.S. Naval Academy in 1945. He was graduated and commissioned an Ensign in June 1949.

CAPTAIN NOEL began graduate education in electronics at the U.S. Naval Postgraduate School at Monterey, California, but then shifted to an applied science program under ONR sponsorship at Princeton University, Princeton, N.J., where he received an M.A. Degree in mathematical statistics in 1956.

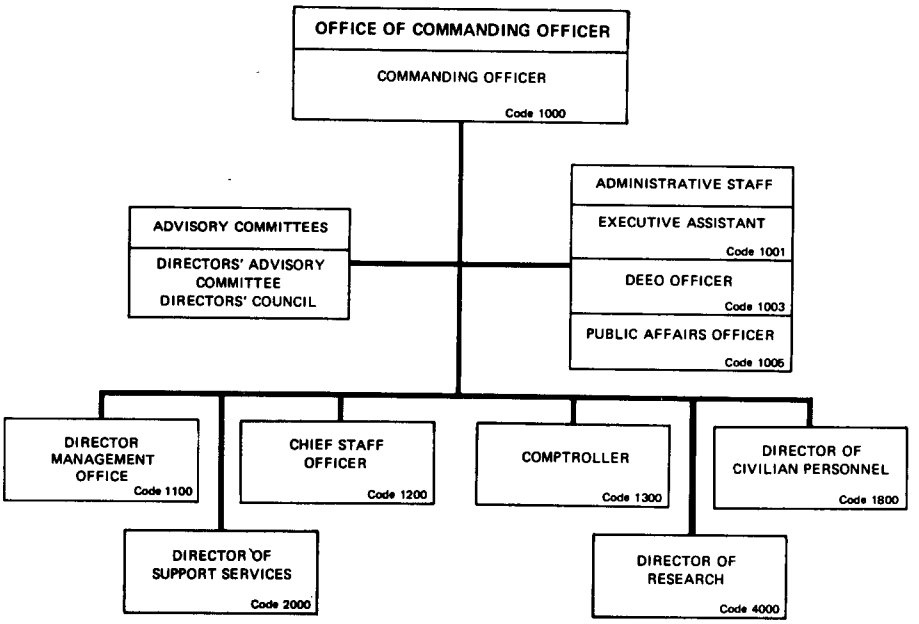
He has served in various shipboard assignments on carriers and minesweepers including duty in Korean waters during the Korean War. In 1958, CAPTAIN NOEL was designated for engineering duty and assigned to the Mare Island Naval Shipyard as Fleet Ballistic Missile (FBM) Project Officer in the construction of USS THEODORE ROOSEVELT (SSBN-600) and USS ANDREW JACKSON (SSBN-619). Additional assignments in the FBM program included: Design Project Officer for SSBN-616 and 640 Classes at Supervisor of Shipbuilding, Groton, Conn. (1961-1965), and Senior Special Projects Representative at Cammell-Laird's Shipyard, Birkenhead, England (1965-1968) in connection with installation and test of the POLARIS Weapon System on British FBM submarines HMS RENOWN (SSBN-02) and HMS REVENGE (SSBN-04).

In 1968, CAPTAIN NOEL reported to the Strategic Systems Project Office as Deputy Technical Director. In this capacity, he served during development and deployment of the POSEIDON Weapon System and development of the TRIDENT Weapon System.

CAPTAIN NOEL assumed command of the Naval Research Laboratory on 30 June 1976. He is a member of the Institute of Mathematical Statistics, Tau Beta Pi, and Eta Kappa Nu, and an associate member of Sigma Xi. For his work with the Fleet Ballistic Missile Program he was awarded the Meritorious Service Medal, and for the POSEIDON and TRIDENT Strategic Weapons Systems, the Legion of Merit.

CAPTAIN NOEL is married to the former Sally Gibson of Ithaca, N.Y. The Noels have four children, Lionel Jr., Dorothy, Andrew, and David, and reside in Falls Church, Va.

OFFICE OF THE COMMANDING OFFICER



Key Personnel

Name	*Title*	*Code*
CAPT L.M. Noel, USN	Commanding Officer	1000
Mr. S.L. Cohen	Executive Assistant	1001
Mr. W.H. Webster	DEEO Officer	1003
Mr. J.E. Sullivan	Public Affairs Officer	1005
Mr. A.M. Toscano	Director, Management Office	1100
CAPT E.L. Ebbert, USN	Chief Staff Officer	1200
Mr. P.F. Kennedy	Comptroller	1300
Mr. F.D. Wallace	Director of Civilian Personnel	1800
CAPT K.P. Hughes, USN	Director of Support Services	2000
Dr. A. Berman	Director of Research	4000

EXECUTIVE ASSISTANT

Basic Responsibilities

The Executive Assistant provides the Commanding Officer with executive-level staff and managerial support in connection with the duties, interests, and activities of the Commanding Officer.

Mr. S. L. Cohen

DEPUTY EQUAL EMPLOYMENT OPPORTUNITY OFFICER

Basic Responsibilities

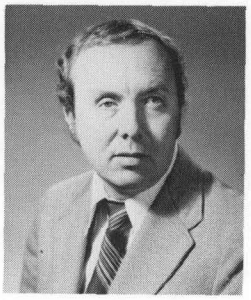
The Deputy Equal Employment Opportunity Officer serves as an advisor to the Commanding Officer on EEO matters; conducts surveys and studies relating to NRL's Affirmative Action Plan and recommends methods for achieving its goals of a fully integrated work force; acts as ex officio member of the EEO Committee; and assists the EEO counselors in settling initial complaints of alleged discrimination.

Mr. W. H. Webster

PUBLIC AFFAIRS OFFICER

Basic Responsibilities

The Public Affairs Officer advises the Commanding Officer and staff on all public affairs matters including external and internal relations; serves as the Commanding Officer's principal assistant in public affairs matters; supervises the Laboratory's public affairs programs, and serves as the focal point for Laboratory implementation of the Freedom of Information Act.



Mr. J. E. Sullivan

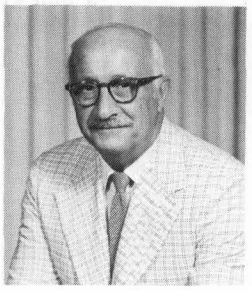
MANAGEMENT OFFICE

Basic Responsibilities

The Management Office provides to the Commanding Officer, Director of Research, Director of Support Services, and all other managers, analysis and advice on concepts, systems, procedures, and techniques that improve the way broad management functions are carried out at the Laboratory. The Office is further responsible for (1) interpreting directives from higher authorities and preparing documentation or recommending appropriate action for responses, (2) ensuring that Laboratory directives are consistent with the policies of NRL and higher authorities, and that they are written to convey the meanings intended, (3) conducting programs such as Cost Reduction, Position Management, and Commercial/Industrial Activities, (4) providing Congressional and OMB liaison, (5) conducting in-house surveys, (6) coordinating and maintaining logistic support agreements, and (7) coordinating inspections and audits of NRL by outside groups.

Key Personnel

Name	*Title*
Mr. A.M. Toscano	Director, Management Office



Mr. A. M. Toscano

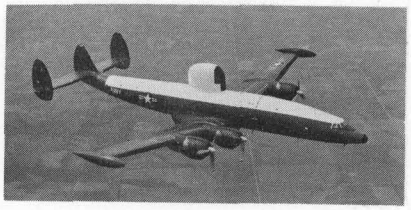
Civilian Personnel

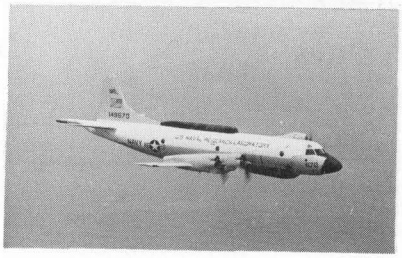
Full-Time Permanent: 9

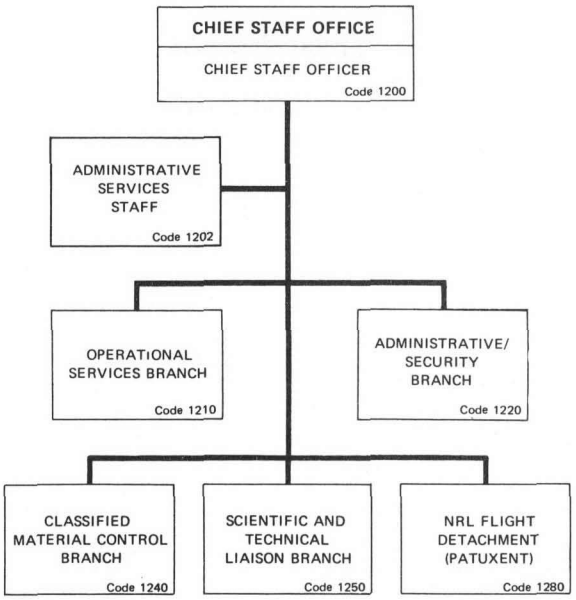
CAPT E. L. Ebbert, USN

Chief Staff Office

- OPERATIONAL SERVICES
- SECURITY
- CLASSIFIED MATERIAL CONTROL
- SCIENTIFIC AND TECHNICAL LIAISON







Basic Responsibilities

The Chief Staff Officer provides a military staff to the Commanding Officer, Naval Research Laboratory, for the purpose of assisting the Commanding Officer in the military aspects of the management of the Laboratory. He conducts liaison with DOD and Navy Commands and activities and the operating forces of the Navy in support of NRL research and development operations and the coordination of the military application of the scientific work of the Laboratory. The staff supports four multiengine Laboratory aircraft and obtains and coordinates such additional air, surface, and subsurface services as are required. The Chief Staff Office is also responsible for personnel and plant security, communications, and control of classified material.

Key Personnel

Name	*Title*
CAPT E.L. Ebbert, USN	Chief Staff Officer
Mr. J.R. Gallagher	Administrative Officer
LT R.S. Cross, USN	Communications/Military Personnel Officer
CDR W.A. Janes, USN	Operational Services Officer
CDR C.L. Hanson, USN	Administrative/Security Officer
Mr. W.C. Bryan	Head, Special Activities Office
Mr. R.E. Abercrombie	Head, Security Section
Mr. G.L. Berkin	Classified Material Control Officer
CDR R.N. Featherston, USN	Scientific and Technical Liaison Officer
CDR R.F. Carlson, USN	OIC, NRL Flight Detachment (Patuxent)

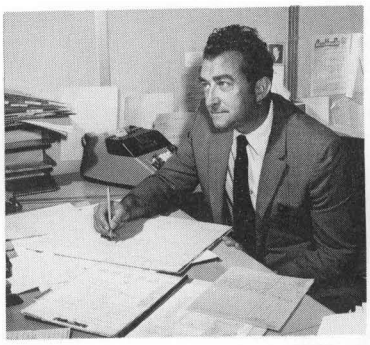
Civilian Personnel

Full-Time Permanent: 81

Military: 81

Mr. P. F. Kennedy

Office of the Comptroller

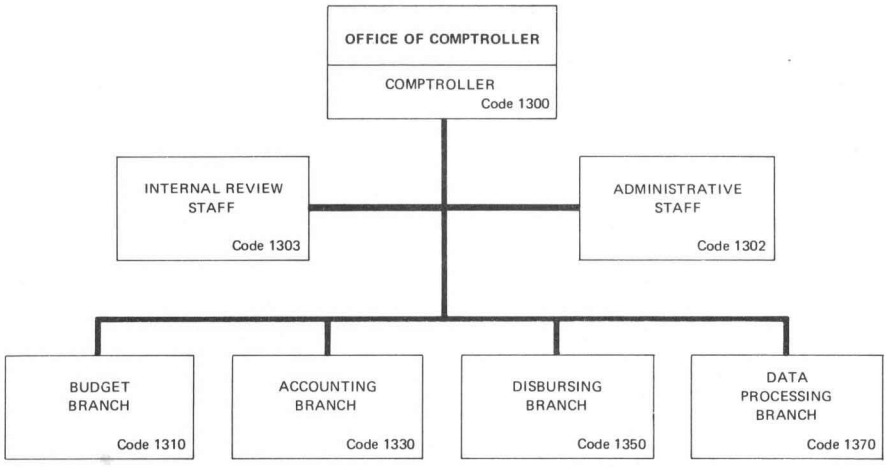


INTERNAL REVIEW

BUDGET OFFICE

COMPUTER

- **BUDGET**
- **ACCOUNTING**
- **DISBURSING**
- **DATA PROCESSING**



Basic Responsibilities

The Comptroller is the financial adviser to the Commanding Officer and other officials of the Laboratory. He administers the financial program of the Laboratory.

Key Personnel

Name	*Title*
Mr. P.F. Kennedy	Comptroller
Mrs. L.M. Boehlert	Administrative Officer
Mr. R.A. Showman	Head, Internal Review Staff
Mr. D.M. Johnson	Budget Officer
Mr. E.S. York	Accounting Officer
Mr. A.E. Thomas	Disbursing Officer
Mr. R.L. Guest	Data Processing Officer

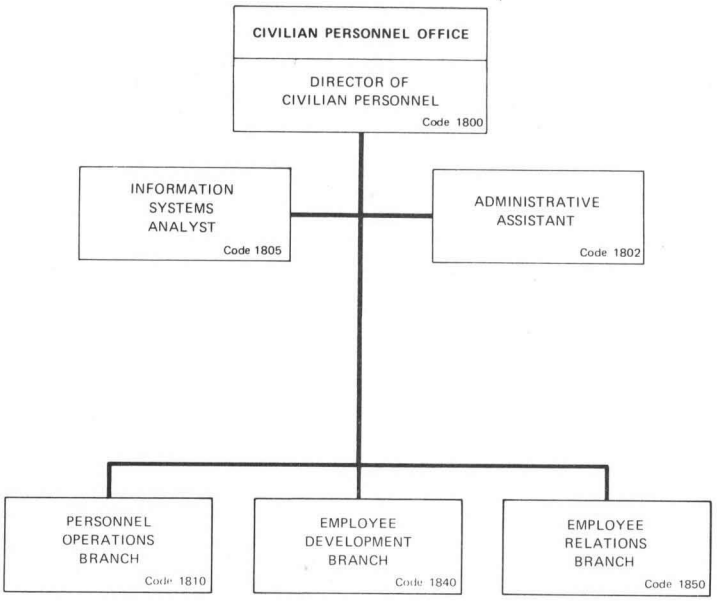
Civilian Personnel

Full-Time Permanent: 85

Mr. F. D. Wallace

Civilian Personnel Office

- **PERSONNEL OPERATIONS**
- **EMPLOYEE DEVELOPMENT**
- **EMPLOYEE RELATIONS**



Basic Responsibilities

The Civilian Personnel Office administers the Laboratory's personnel program, which includes selection, development, promotion, utilization, appropriate recognition, and employee counseling and services for all civilian personnel.

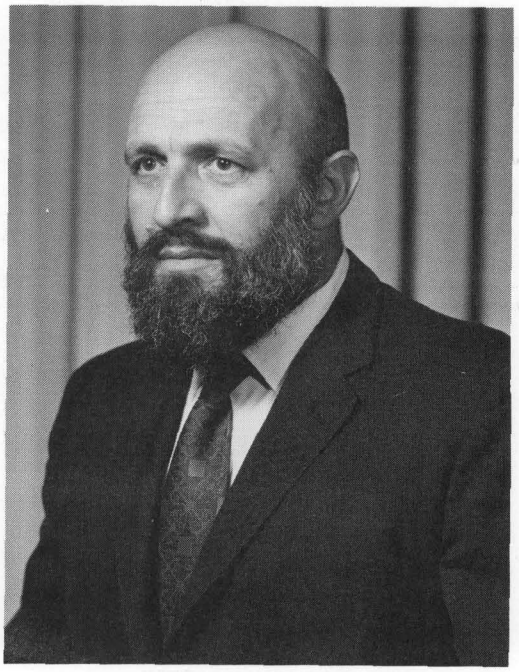
Key Personnel

Name	*Title*
Mr. F.D. Wallace	Director of Civilian Personnel
Mrs. J. Gandy	Administrative Assistant
Mr. A.F. Osborne	Information Systems Analyst
Mr. D.J. Blome	Head, Personnel Operations Branch
Dr. O.J. Doty	Head, Employee Development Branch
Mr. F. Carter	Head, Employee Relations Branch

Civilian Personnel

Full-Time Permanent: 43

Director of Research



Dr. Alan Berman

Dr. Berman [redacted] He received the A.B. degree in physics from Columbia College in 1947 and the Ph.D. degree in physics from Columbia University in 1952.

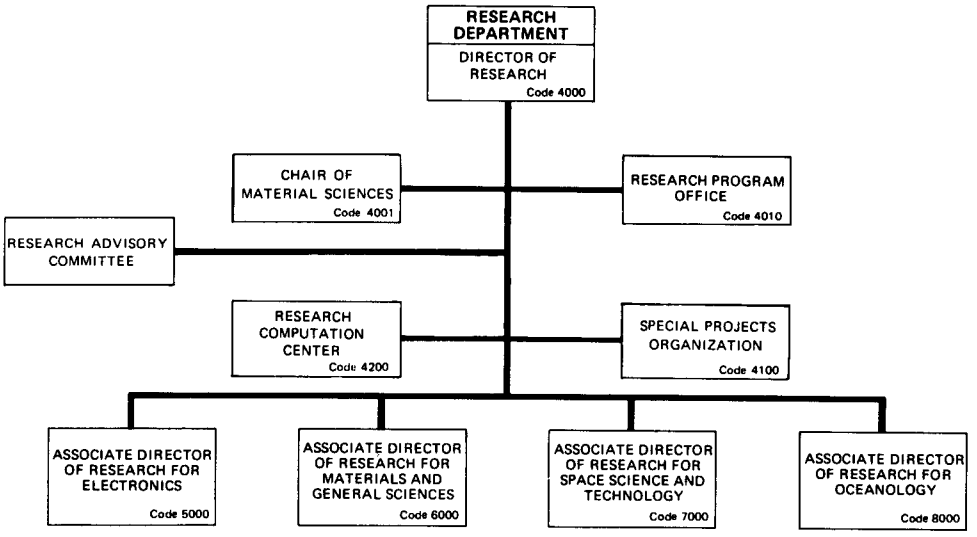
He began his scientific career in 1952 as a research scientist at the Hudson Laboratories of Columbia University. He became Assistant Director of Hudson Laboratories in 1955, Associate Director in 1957, and Director in 1963. Dr. Berman became Director of Research for the Naval Research Laboratory in May 1967.

Dr. Berman's personal research specialties include the areas of underwater acoustics, oceanography, and signal processing. He has published numerous papers on these and related subjects and has served on many Navy and national-level advisory groups. In addition to providing consultative services for a number of Department of Defense and other Government agencies, he has led several interagency study groups and has served as a consultant to the National Security Council and the Office of Science and Technology Policy.

Dr. Berman has on three occassions served as a visiting scientist at the Admiralty Research Laboratory, Teddington, England (1955, 1957, 1960), and once at the SACLANT ASW Research Center, La Spezia, Italy (1960). He is a fellow of the American Physical Society and the Acoustical Society of America, and is a member of the American Institute of Physics and Sigma Xi.

In 1969 Dr. Berman was awarded the Department of the Navy Superior Civilian Service Award. In 1973 he received the Department of Defense Distinguished Civilian Service Award, and in 1977 he received a personal letter of commendation from the President for his services as a technical advisor to the National Security Council.

Dr. Berman and his wife Charlotte live in Alexandria, Virginia. They have three daughters and two sons.



Key Personnel

Name	*Title*	*Code*
Dr. A. Berman	Director of Research	4000
Mr. A.J. Hollings	Head, Research Program Office	4010
Mr R.E. Ellis	Head, Special Projects Organization	4100
Mr. A.B. Bligh	Head, Research Computation Center	4200
Dr. H.Q. North	Associate Director of Research for Electronics	5000
Dr. A.I. Schindler	Associate Director of Research for Materials and General Sciences	6000
Dr. H. Rabin	Associate Director of Research for Space Science and Technology	7000
Mr. R.R. Rojas	Associate Director of Research for Oceanology	8000

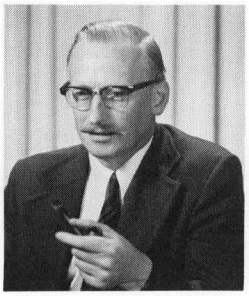
RESEARCH PROGRAM OFFICE

Basic Responsibilities

The Research Program Office serves as staff to the research directorate of the Laboratory. It provides an orderly plan for coordinating NRL research programs with those of ONR and other sponsors or potential sponsors throughout the Departments of the Navy, the Army, and the Air Force, the Defense Advanced Research Projects Agency, and other agencies of the government. It also serves as a focal point for program information, for project managers, and other key personnel of sponsoring activities on work in progress or in various stages of planning. The Research Program Office maintains a management information center which serves as a working tool for the Laboratory directorate, and it maintains appropriate records of the Laboratory's research programs.

Key Personnel

Name	*Title*
Mr. A.J. Hollings	Head, Research Program Office
Mr. R.C. Spragg	Deputy Head, Research Program Office, and Head, Management Information Center Section
Mr. R. Donley	Head, Program Planning and Administration Section
Mr. N. Moglen	Staff Assistant -- ADP



Mr. A. J. Hollings

Civilian Personnel

Full-Time Permanent: 10

SPECIAL PROJECTS ORGANIZATION

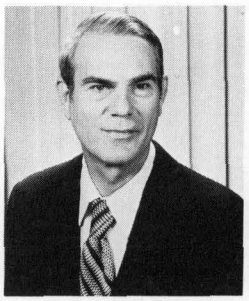
Basic Responsibilities

The primary function of the Special Projects Organization is to provide technical support to the Director of Research. This support falls into approximately four general categories. One of these is an individual or small group conducting a special theoretical analysis or study, usually on a short duration basis, that is assigned by the Director of Research. Another category of support is project responsibility for work that does not logically fall within the area of responsibility of one of the Line Divisions. A third category of support involves project responsibility for programs that involve the coordinated efforts of a number of NRL Line Divisions or Branches. The last broad category involves new project starts. This concerns projects which are not currently on-going in the Laboratory but those which management feels may have future potential.

In addition, the Special Projects Organization serves as a facility and basic staff to conduct special highly classified projects.

Key Personnel

Name	*Title*
Mr. R.E. Ellis	Head, Special Projects Organization
Dr. A.H. Aitken	Associate Head, Special Projects Org.
Mrs. B.A. Maag	Administrative Officer
Dr. P.B. Richards	Fleet Medical Support Project Staff
Mr. E.L. Brancato	Consultant Staff
Dr. S. Teitler	Advanced Concepts Staff
Dr. A.H. Aitken	Laser CM/CCM Program Office
Dr. J.M. MacCallum	EOTPO Head
Dr. J.C. Kershenstein	Liaison Representative to NAVMAT 08TE1
Mr. C.L. Tipton	Head, Special Applications Branch
Mrs. E.E. Wald	Head, Software Systems Development Branch



Mr. R. E. Ellis

Civilian Personnel

Full-Time Permanent: 42
Military: 1

Total Estimated R&D Funding

Fiscal Year 1977: $2,500,000

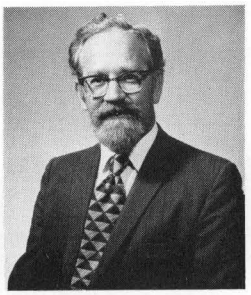
RESEARCH COMPUTATION CENTER

Basic Responsibilities

The Research Computation Center (RCC) provides for the operation and maintenance of the Laboratory's central computer facilities for the benefit of all Divisions of the Laboratory; develops and maintains equipment for data collection purposes and for converting field-collected data to a form suitable for efficient processing; provides system software support services for its computers; and provides a variety of user support and applications programming services. The RCC also provides appropriate ADP technical logistic support services for NRL; identifies ADP requirements and secures and administers contractual ADP support services; and supports the NRL Computation Committee and the Navy Laboratories Computing Committee. The Head of the RCC provides the principal support to the Director of Research in ADP management and planning and is, by additional duty assignment, the ONR Special Assistant for ADP Coordination.

Key Personnel

Name	*Title*
Mr. A.B. Bligh	Head, Research Computation Center
Ms. D.E. Gossett	Deputy Head
Ms. J.C. McCullough	Administrative Officer
Mr. J.B. Smith	External Relations Staff
Mr. E.L. Aiken	Timesharing Comp Group
Mr. I.J. Levy	Head, Operations and Engineering Branch
Mr. G.J. Flenner	Head, Software Systems and Support Branch



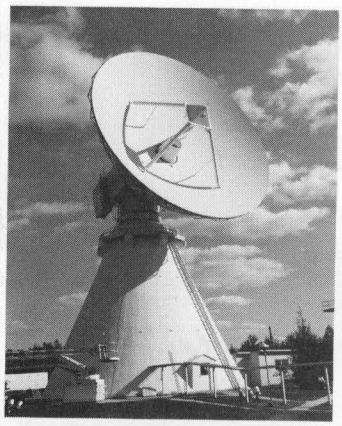
Mr. A. B. Bligh

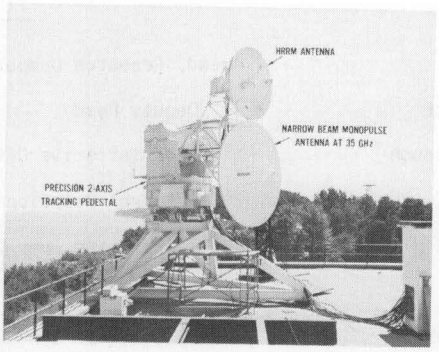
Civilian Personnel

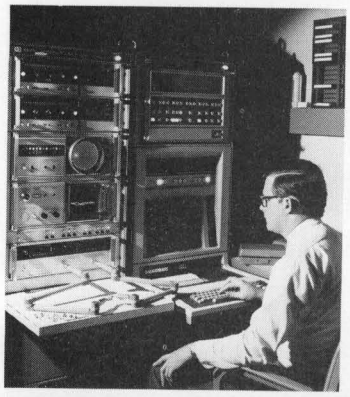
Full-Time Permanent: 47

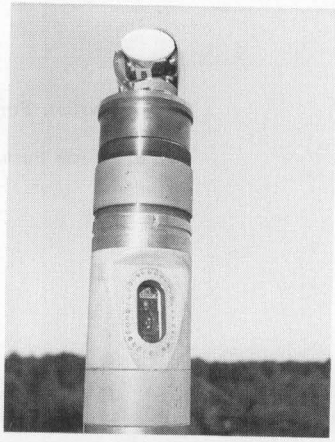
Electronics Area

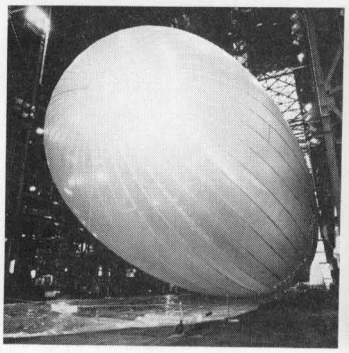
The Navy's operational effectiveness depends greatly on its ability to make optimum use of the electromagnetic spectrum ranging from the very low to the extremely high frequencies. Accordingly, most of this Area's work is directed toward extending both the knowledge and the technological applications of the electromagnetic spectrum. The effort includes investigation of electronic devices, the phenomenology and advanced instrumentation associated with radio communications, radar, and related sensors, and digital computation and information processing.

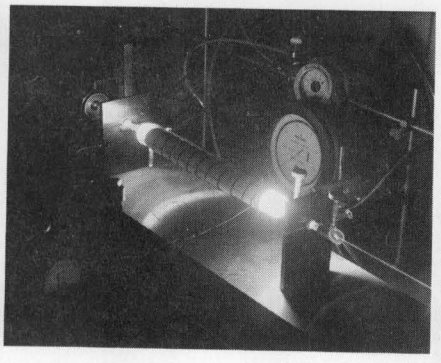












Associate Director of Research for Electronics

Dr. Harper Q. North

Dr. North [redacted]. He graduated from the California Institute of Technology in 1938 with a B.S. degree in science. He obtained his M.A. and Ph.D., both in physics, from the University of California at Los Angeles, in 1940 and 1947, respectively. He completed the University of California at Los Angeles Executive Program in Business Management in 1958.

Dr. North joined the Research Department of NRL as the Associate Director of Research for Electronics on 17 March 1975. He came to NRL from the Northrop Corporation where, since 1973, he had been the Consultant to the Division General Manager. From 1969 to 1973, as Head of the Electro Optical Department of Northrop, he was responsible for developing a family of digitally addressed, flat cathode-ray tubes for military applications.

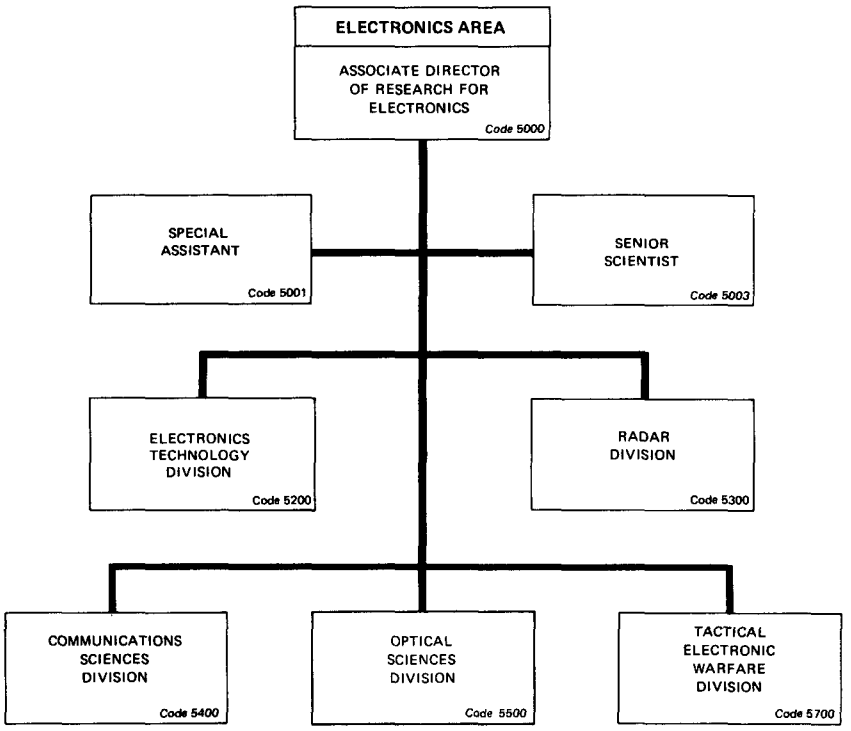
From 1962 to 1969 Dr. North was Corporate Vice President, Research and Development, for TRW, Inc. In 1954 he founded Pacific Semi-Conductors, Inc. (now the TRW Semi-Conductor Division) and was the Company's President from 1954 to 1962.

From 1949 to 1954, he was Director of the Semi-Conductor Division of the Hughes Aircraft Company, and he holds patents on the familiar miniature glass diode which has been manufactured throughout the world.

From 1940 to 1949, Dr. North worked as a Research Associate in the General Electric Research Laboratory, where he was involved in various research and development projects, including the development of radar mixer crystals, and the discovery of the "varactor diode" principle in germanium.

Dr. North served for two years as Chairman of the Board of Governors of the Electronic Industries Association, and he received the Organization's Medal of Honor in 1966. He has written numerous articles and papers on a variety of technical subjects, technological forecasting, and management. He also holds a number of patents.

Dr. North is a Fellow of the Institute of Electrical and Electronic Engineers and a Fellow of the American Physical Society. He served for several years as Chairman of the Advisory Group on Electron Devices, Office of the Department of Defense Research and Engineering.


ELECTRONICS AREA
ASSOCIATE DIRECTOR OF RESEARCH FOR ELECTRONICS
Code 5000
SPECIAL ASSISTANT
Code 5001
SENIOR SCIENTIST
Code 5003
ELECTRONICS TECHNOLOGY DIVISION
Code 5200
RADAR DIVISION
Code 5300
COMMUNICATIONS SCIENCES DIVISION
Code 5400
OPTICAL SCIENCES DIVISION
Code 5500
TACTICAL ELECTRONIC WARFARE DIVISION
Code 5700

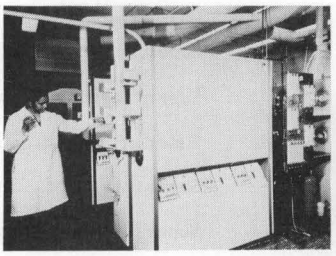
Key Personnel

Name	*Title*
Dr. H.Q. North	Associate Director of Research for Electronics
Mr. E.M. Man	Special Assistant
Dr. L.B. Wetzel	Senior Scientist
Mr. H. Bress	Consultant
Mr. A. Brodzinsky	Superintendent, Electronics Technology Division
Dr. M.I. Skolnik	Superintendent, Radar Division
Dr. B. Wald	Superintendent, Communications Sciences Division
Dr. T.A. Jacobs	Superintendent, Optical Sciences Division
Mr. L.A. Cosby	Superintendent, Tactical Electronic Warfare Division

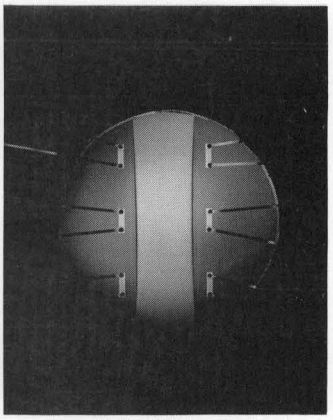
Mr. A. Brodzinsky

Electronics Technology Division

- SOLID STATE DEVICES
- ELECTRONIC MATERIAL TECHNOLOGY
- SURFACE PHYSICS
- MICROWAVE TECHNIQUES
- MICROELECTRONICS
- SEMICONDUCTORS

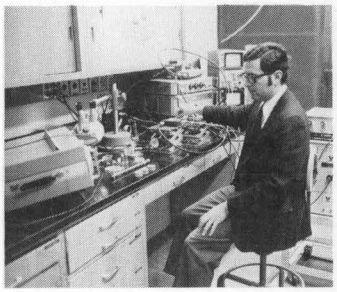


FABRICATION OF SOLID STATE DEVICES

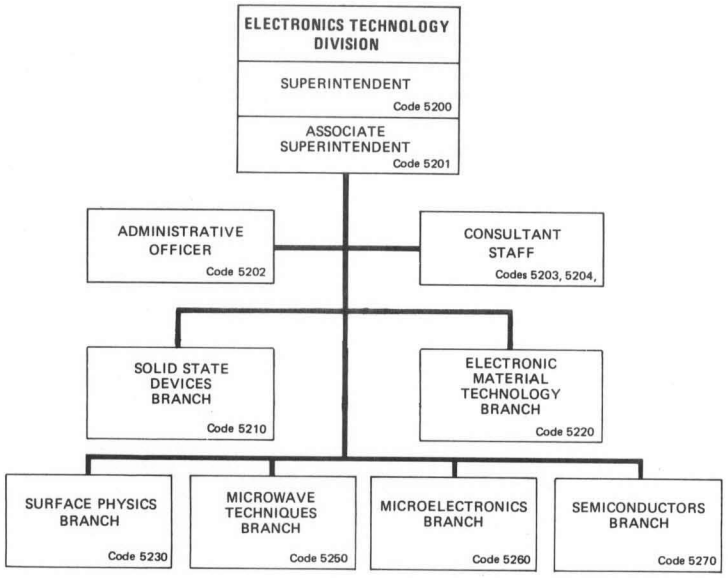


SURFACE ACOUSTIC WAVE DELAY LINES FABRICATED ON SILICON WAFER WITH THE USE OF ZINC OXIDE LAYERS

MICROWAVE DEVICES AND CIRCUITS



ARC PLASMA GROWTH OF MAGNETIC CRYSTALS



Basic Responsibilities

The Electronics Technology Division carries out programs of basic and applied research and development in the fields of electronic properties of solid materials, materials development, surface physics, microwave techniques, microelectronic devices research and fabrication, high-power microwave generation, and basic research in electronic materials, especially semiconductors. The activities of the Division couple device research both to basic materials investigations and to systems research and development needs.

Branches

Solid State Devices
- Ion implantation technology
- High- and low-power devices for energy conversion
- Field effect transistor reliability and failure analysis
- MIS failure physics; radiation vulnerability and hardening
- High-frequency microwave devices

Electronic Material Technology
- Preparation and development of magnetic dielectric, optic, and semiconductor materials
- Optical components and coatings, glass-blowing, and microwave tube assembly

Surface Physics
- Surface and interface physics
- Cathode research and development
- Characterization of and growth of semiconductor, metal, and insulator films and surfaces
- Bonding and adhesion studies
- Thermionic energy conversion

Microwave Techniques
- Surface acoustic waves
- Microwave and millimeter wave integrated circuits
- Surface magnetostatic waves
- Microwave solid state sources
- Microwave ferrimagnetic and ferromagnetic components
- Millimeter wave device research

Microelectronics
- Silicon device processing
- Microelectronic fabrications
- Integrated circuit technology

Semiconductors
- Solid state theory
- Electrical and optical characterization of materials
- Impurity and defect studies
- Structural and electronic properties of amorphous semiconductors
- Optical and magnetooptical studies of surface and interfaces

Key Personnel

Name	*Title*
Mr. A. Brodzinsky	Superintendent
Mrs. M.H. Grimes	Administrative Officer
Dr. L. Young	Consultant
Mr. M. Siegmann	Consultant
Dr. J.E. Davey†	Head, Solid State Devices Branch
Mr. H. Lessoff	Head, Electronic Material Technology Branch
Dr. R.F. Greene	Head, Surface Physics Branch
Dr. L.R. Whicker	Head, Microwave Techniques Branch
Dr. D.F. Barbe	Head, Microelectronics Branch
Dr. B.D. McCombe	Head, Semiconductors Branch

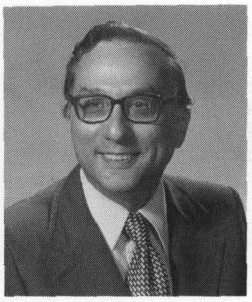
Civilian Personnel

Full-Time Permanent: 117

Total Estimated R&D Funding

Fiscal Year 1977: $10,200,000

†Additional duty as acting Associate Superintendent

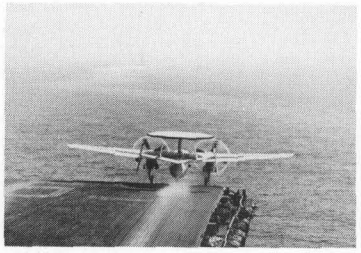


Dr. M. I. Skolnik

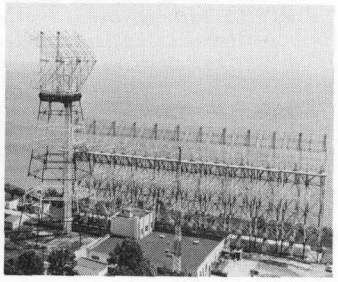
Radar Division

- RADAR TECHNIQUES
- SEARCH RADAR
- TARGET CHARACTERISTICS
- AIRBORNE RADAR

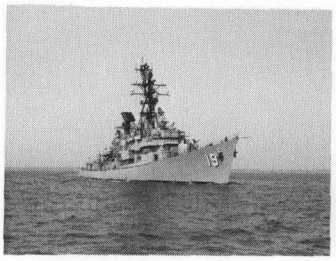
AIRBORNE EARLY WARNING RADAR
SYNTHETIC APERTURE RADAR



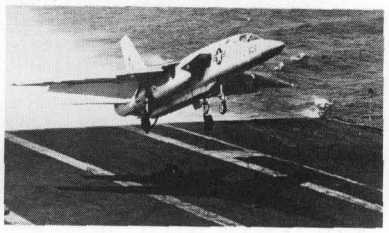
OVER THE HORIZON RADAR "MADRE"

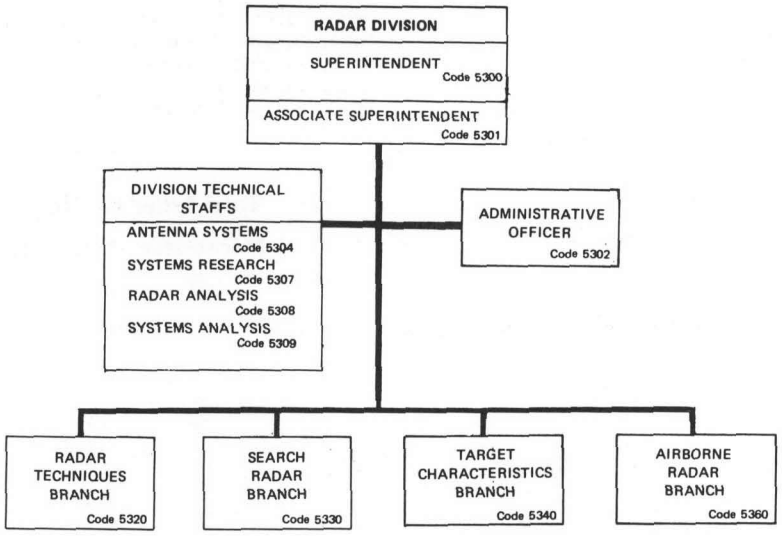


SHIPBOARD SURVEILLANCE
AND WEAPON CONTROL RADAR



AIRBORNE-INTERCEPTOR RADAR





Basic Responsibilities

The Radar Division conducts research on basic physical phenomena of importance to radar and related sensors, investigates new engineering techniques applicable to radar, demonstrates the feasibility of new radar concepts and systems, performs related systems analysis and evaluation of radar, and provides special consultative services. The emphasis is on new and advanced concepts and technology in radar and related sensors which are applicable to enhancing the Navy's ability to fulfill its mission.

Staff Activities

Radar Analysis
- Automatic detection and tracking
- Radar systems simulations

Antenna Systems
- Microwave antenna research
- Electromechanical design

Systems Analysis
- Airborne weapon systems simulation
- Anti-air weapons countermeasures
- Air combat research

Systems Research
- Conceptual studies of new radar systems
- Overview radar research investigations for the Fleet

Branches

Radar Techniques
- High-frequency radar
- Signal processing
- Ionospheric radio-wave transmission

Search Radar
- Shipboard and range instrumentation radar
- Phased array techniques
- Precision tracking techniques
- Low probability of intercept radar

Target Characteristics
- Adaptive signal processing
- Systems development
- Shipboard radar concepts
- Target signature analysis
- Radar counter-countermeasures

Airborne Radar
- Airborne radar
- Airborne early warning radar
- Moving target indication
- Synthetic aperture radar (SAR)
- Remote sensing

Key Personnel

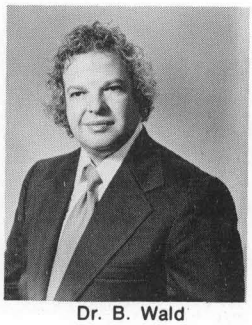
Name	*Title*
Dr. M.I. Skolnik	Superintendent
Mr. I.O. Olin	Associate Superintendent
Mrs. A.G. Dunn	Administrative Officer
Dr. G.V. Trunk	Head, Radar Analysis Staff
Dr. M.I. Skolnik	Head, Systems Research Staff
Mr. C.M. Loughmiller	Head, Systems Analysis Staff
Dr. W. Gabriel	Head, Antenna Systems Staff
Mr. J.M. Headrick	Head, Radar Techniques Branch
Dr. C.L. Temes	Head, Search Radar Branch
Mr. J.P. Shelton	Head, Target Characteristics Branch
Mr. D.L. Ringwalt	Head, Airborne Radar Branch

Civilian Personnel

Full-Time Permanent: 126

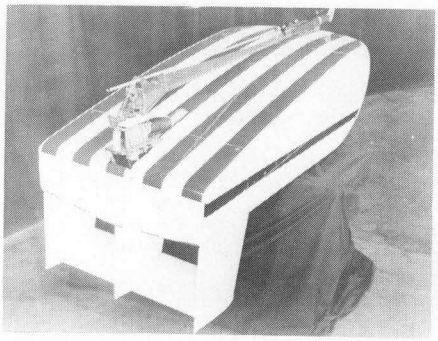
Total Estimated R&D Funding

Fiscal Year 1977: $12,700,000



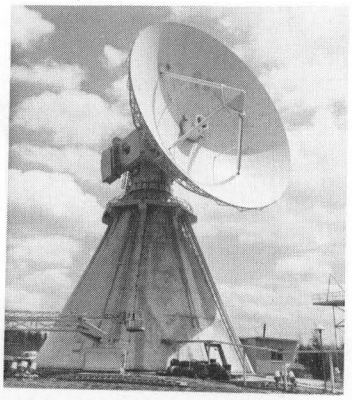
Dr. B. Wald

Communications Sciences Division

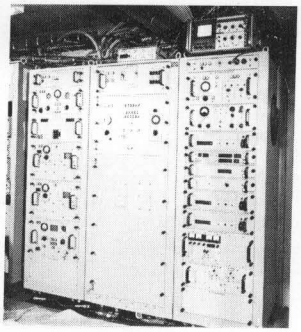


AN/BSQ-5 (XB-1)
SUBMARINE TOWED
COMMUNICATION BUOY

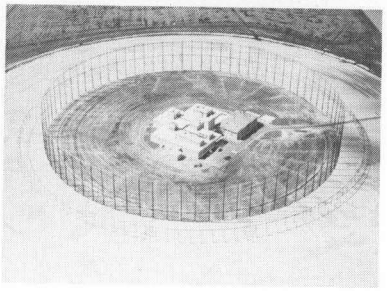
MICROWAVE SPACE
RESEARCH FACILITY



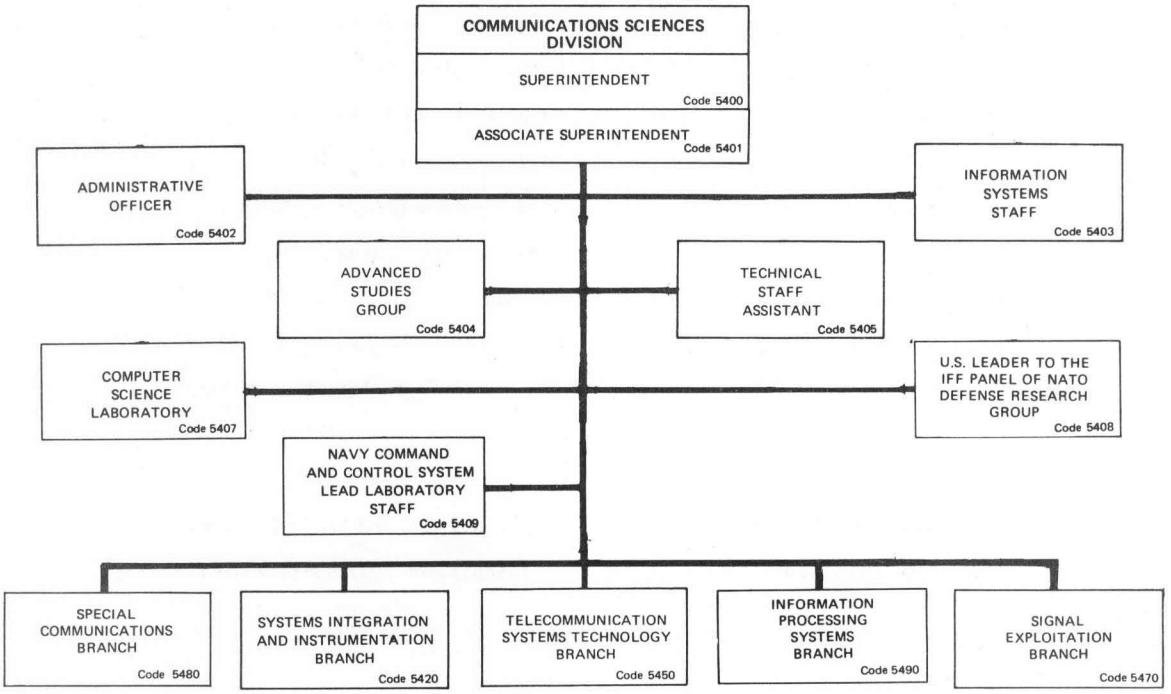
- TELECOMMUNICATION SYSTEMS TECHNOLOGY
- SYSTEMS INTEGRATION AND INSTRUMENTATION
- SIGNAL EXPLOITATION
- SPECIAL COMMUNICATIONS
- INFORMATION PROCESSING SYSTEMS



AN/SSC-7 SHIPBOARD
SHF SATCOM SET



HF ANTENNA



Basic Responsibilities

The Communications Sciences Division conducts research and development in the systems, sensors, techniques, instrumentation and phenomenology of communications, command and control, signal exploitation, and information processing. The major emphasis is placed on those new concepts and techniques that will specifically enhance the Navy's capabilities in the collection, processing, transmission, and distribution of information.

Staff Activities

Computer Science Lab
- Intelligent systems
- Clustering and pattern recognition
- Heuristics

Navy Command & Control System Lead Laboratory
- Technical/management overview
- Goal clarification
- Transition planning

Information Systems Staff
- System architecture
- Information management
- Software engineering

Branches

Systems Integration and Instrumentation
- Narrow-band digital voice systems
- Secure communication systems
- Source data and channel encoding

Signal Exploitation
- Radio frequency intercept and signal processing
- Direction finding and position location
- Signal storage and display

Special Communications
- Antijam and LPI communications
- Satellite communications systems
- Advanced modems and processors

Information Processing Systems
- High-performance signal processors
- Computer family architecture
- Signal processing language

Telecommunication Systems Technology
- Submarine communications technology
- Investigation of elecromagnetic transmission media
- Adaptive communications control techniques

Key Personnel

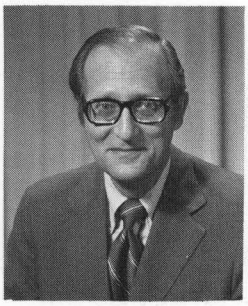
Name	*Title*
Dr. B. Wald	Superintendent
Mr. W.E. Garner	Associate Superintendent
Mrs. C.E. Holt	Administrative Officer
Mr. M.L. Musselman	Technical Staff Assistant
Dr. J.E. Shore	Head, Information Systems Staff
Dr. J.R. Slagle	Head, Computer Science Laboratory
Mr. C.V. Parker	U.S. Leader to the IFF Panel of the NATO Defense Research Group
Dr. M.E. Melich	Head, Navy Command & Control System Lead Laboratory
Dr. W.S. Ament	Advanced Studies Group
Mr. D.I. Himes	Head, Systems Integration and Instrumentation Branch
Dr. J.R. Davis	Head, Telecommunication Systems Technology Branch
Mr. R.D. Misner	Head, Signal Exploitation Branch
Dr. R.A. LeFande	Head, Special Communications Branch
Mr. Y.S. Wu	Head, Information Processing Systems Branch

Civilian Personnel

Full-Time Permanent: 171

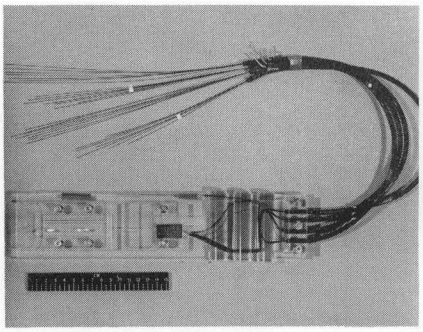
Total Estimated R&D Funding

Fiscal Year 1977: $16,000,000

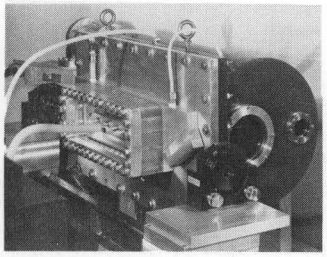


Dr. T. A. Jacobs

Optical Sciences Division

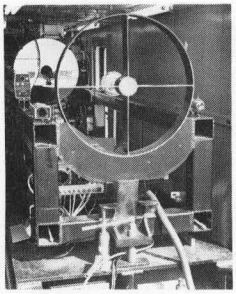


MULTICHANNEL FIBER OPTICS COUPLER

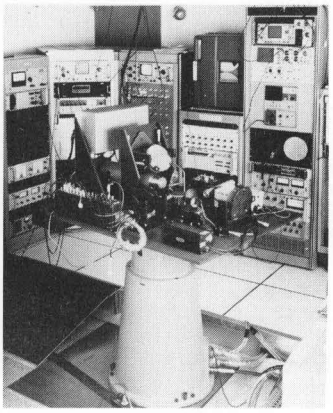


HIGH-PRESSURE TUNABLE INFRARED LASER

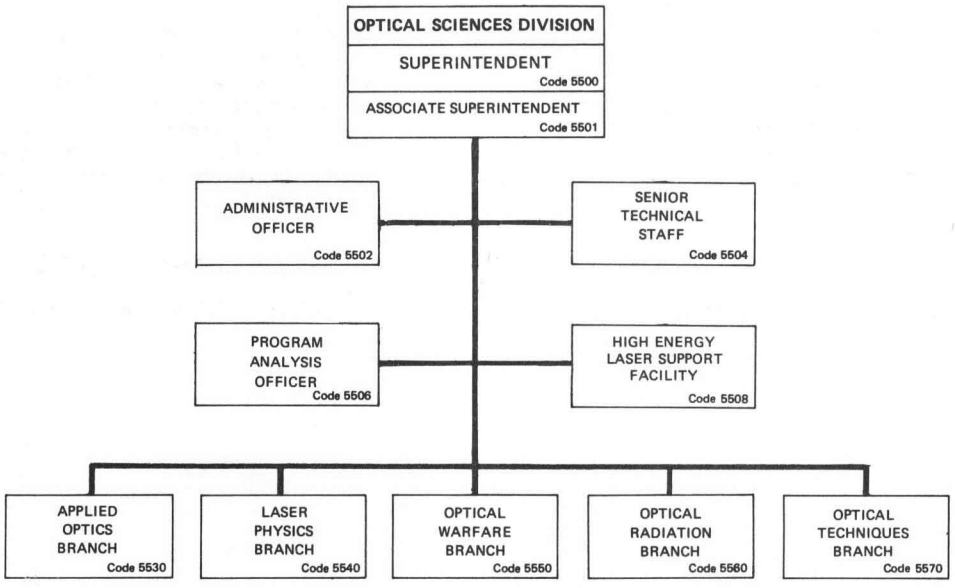
- APPLIED OPTICS
- LASER PHYSICS
- OPTICAL WARFARE
- OPTICAL RADIATION
- OPTICAL TECHNIQUES



MOBILE OPTICAL TRANSMITTER TELESCOPE



RATE TABLE



Basic Responsibilities

The Optical Sciences Division carries out a variety of research, development, and application-oriented activities in the generation, propagation, detection, and use of radiation in the wavelength region between near-ultraviolet and far-infrared wavelengths. The research, both theoretical and experimental, is concerned with discovering and understanding the basic physical principles and mechanisms involved in optical devices and phenomena. The development effort is aimed at extending this understanding in the direction of device engineering and advanced operational techniques. The applications activities include systems analysis and prototype system development and exploitation of research and development for the solution of optically related military problems. In addition to its internal program activities, the Division serves the Laboratory specifically and the Navy generally as a consulting body of experts in optical sciences. The work in the Division includes studies in quantum optics, laser physics, infrared physics, laser-matter interactions, atmospheric propagation, optical technology, holography, optical warfare, optical data processing, optical systems, and optical diagnostic techniques. A variety of field measurement programs on optical problems of specific interest are also conducted.

Staff Activities

Senior Scientific and Consultant Staff
- Special systems analysis
- Technical study groups
- Technical contract monitoring

Branches

Optical Techniques
- Nonlinear optical phenomena
- Picosecond light pulses
- Nonlinear effects in materials
- Optical waveguides
- Molecular waveguides
- Laser-matter interactions

Optical Warfare
- Optical and IR countermeasures
- Optical intelligence
- Optical Seeker studies

Optical Radiation
- Electro-optic applications
- Optical instrumentation
- Interferometry
- Atmospheric optics
- Propogation studies

Laser Physics
- Molecular laser physics
- Chemical laser physics
- Electrically driven lasers
- Laser-induced reactions

Applied Optics
- Optical Processing
- Optical characteristics of military targets
- Optical technology
- Laser x-ray generation

Key Personnel

Name	*Title*
Dr. T. A. Jacobs	Superintendent
Dr. L.F. Drummeter, Jr.	Associate Superintendent
Mrs. H. Burchell	Administrative Officer
Mr. D.F. France	Program Analysis Officer
Dr. R.C. Elton	Senior Technical Staff
Dr. W.L. Faust	Senior Technical Staff
Dr. P.M. Livingston	Senior Technical Staff
Dr. A.J. Skalafuris	Senior Technical Staff
Mr. J. Giuliani	Senior Technical Staff
Dr. R.A. Patten	Head, Applied Optics Branch
Dr. W.S. Watt	Head, Laser Physics Branch
Dr. L.F. Drummeter, Jr.*	Head, Optical Warfare Branch
Dr. P.B. Ulrich*	Head, Optical Radiation Branch
Dr. T.G. Giallorenzi	Head, Optical Techniques Branch

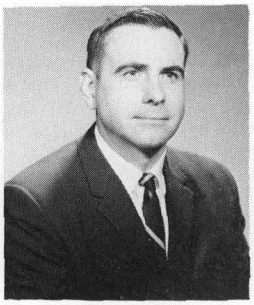
Civilian Personnel

Full-Time Permanent: 95

Total Estimated R&D Funding

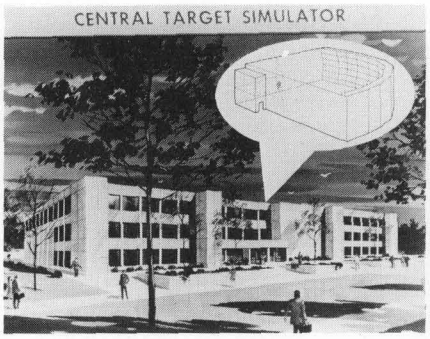
Fiscal Year 1977: $10,100,000

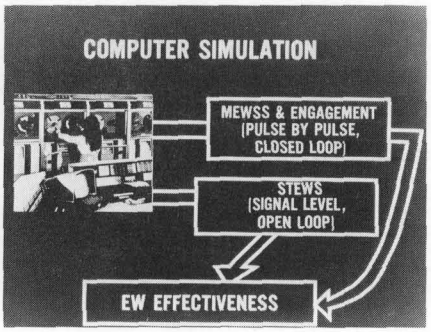
*Acting



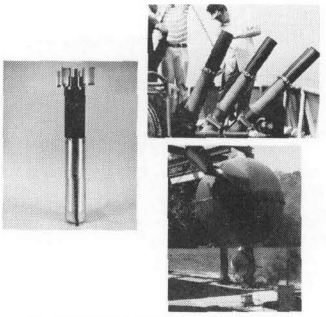
Mr. L. A. Cosby

Tactical Electronic Warfare Division

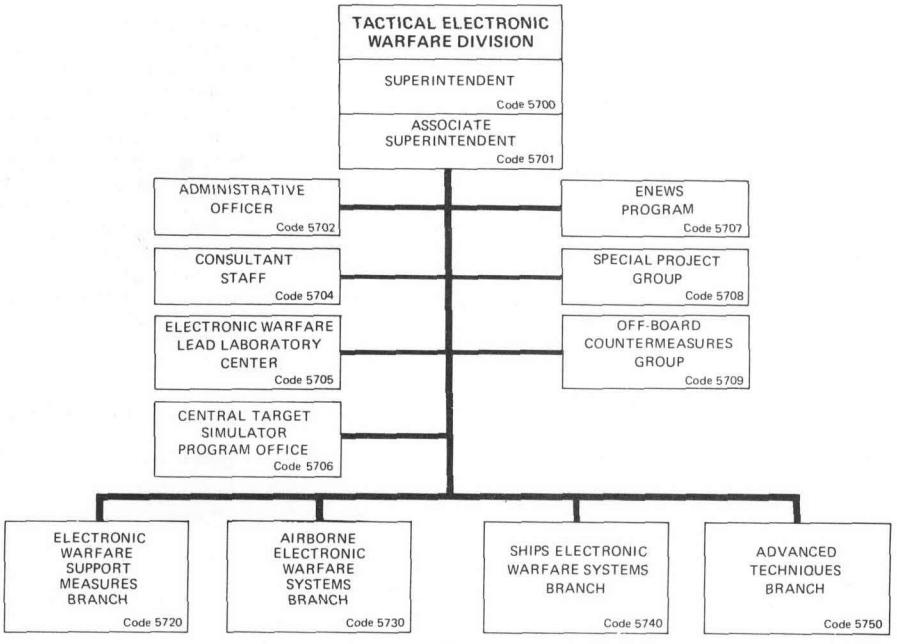




- AIRBORNE ELECTRONIC WARFARE SYSTEMS
- SHIPS ELECTRONIC WARFARE SYSTEMS
- ADVANCED TECHNIQUES
- ELECTRONIC WARFARE SUPPORT MEASURES



OFF-BOARD COUNTERMEASURES



Basic Responsibilities

The Tactical Electronic Warfare Division is responsible for research and development in support of the Navy's tactical electronic warfare requirements and missions. These include electronic warfare support measures, electronic countermeasures, and supporting counter-countermeasures, as well as study, analyses, and simulations for the determination and improvement of the effectiveness of these systems.

Staff Activities

Lead Laboratory Coordinating Staff
- Navy in-house exploratory development
- Program reference center
- Navy Laboratory Electronic Warfare Advisory Group
- Threat analyses
- Liaison w/other laboratories & commands

Off-Board Countermeasures Group
- Expendable technology
- Expendable devices
- Off-board systems

Central Target Simulator Program
- Design, construct, operate CTS Facility

Effectiveness of Naval EW Systems (ENEWS)
- EW effectiveness
- Simulation analysis and measurement
- Research & development support

Special Project Group
- Vulnerability analysis
- Special countermeasures

Branches

Airborne Electronic Warfare Systems
- Air systems development
- Penetration aids
- Power source development

Ships Electronic Warfare Systems
- Ships systems development
- Jamming technology
- Deception techniques
- EW antennas
- Threat simulators

Electronic Warfare Support Measures
- Intercept systems
- Direction finding
- Systems integration
- Command and control interfaces
- Signal processing

Advanced Techniques
- Analysis and modeling simulation
- New EW techniques
- Experimental systems
- EW concepts

Key Personnel

Name	*Title*
Mr. L.A. Cosby	Superintendent
Dr. G.P Ohman	Associate Superintendent
Miss G. Batchelder	Administrative Officer
Mr. M.J. Sheets	Lead Laboratory Coordinator and Head, Electronic Warfare Lead Laboratory Center
Mr. A.A. DiMattesa	Manager, Central Target Simulator Program
Mr. D.F. Grady	Manager, ENEWS Program
Mr. L.A. Cosby	Program Manager, Special Project Group
Mr. N.J. Lesko	Deputy Program Manager, Special Project Group
Mr. J.A. Montgomery	Head, Off-Board Countermeasures Group
Mr. H.W. Zwack	Head, Electronic Warfare Support Measures Branch
Mr. E.E. Koos	Head, Airborne Electronic Warfare Systems Branch
Mr. L.O. Sweet	Head, Ships Electronic Warfare Systems Branch
Dr. G.E. Freidman	Head, Advanced Techniques Branch

Civilian Personnel

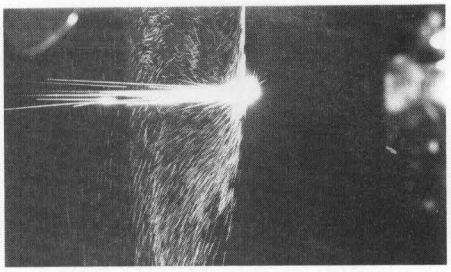
Full-Time Permanent: 175

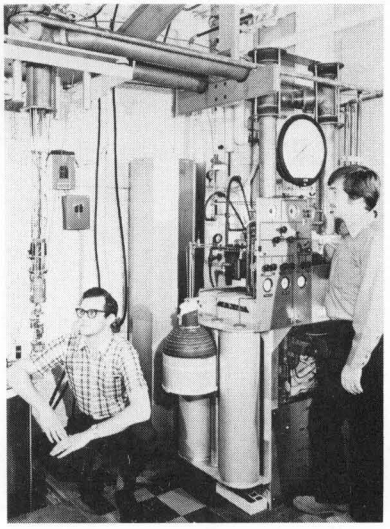
Total Estimated R&D Funding

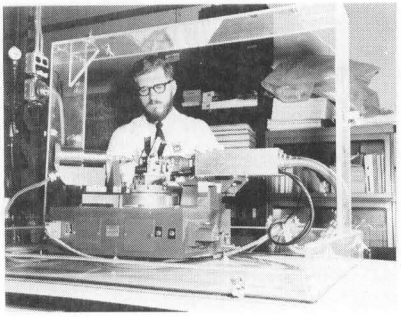
Fiscal Year 1977: $22,600,000

Materials and General Sciences Area

The Materials and General Sciences Area consists of chemists, metallurgists, and solid-state, optical, and nuclear scientists who (a) carry on interdisciplinary basic and applied research on the mechanical, electrical, thermal, magnetic, optical, and nuclear properties of matter, and (b) develop components, devices, and systems based on the phenomena and principles of the several disciplines involved.







Associate Director of Research for Materials and General Sciences

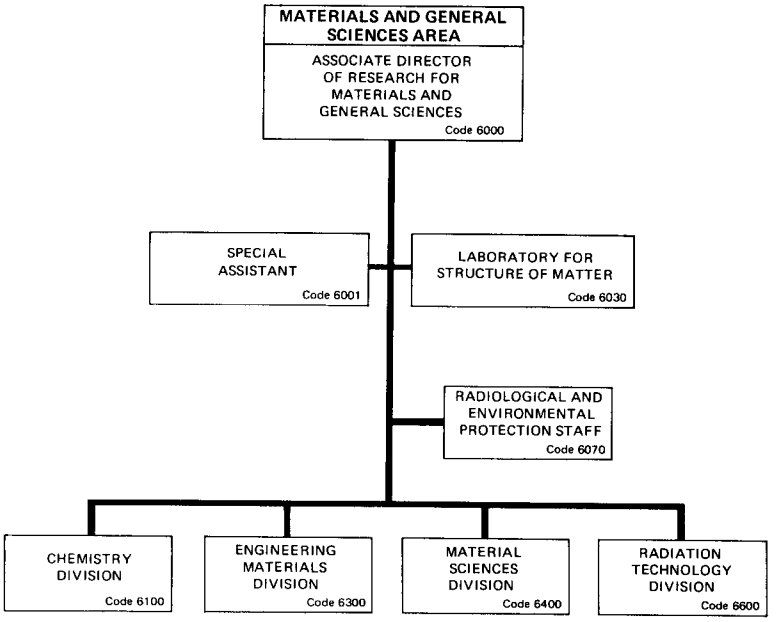
Dr. Albert I. Schindler

Dr. Schindler was born in Pittsburgh, Pennsylvania, on June 24, 1927. He received the degrees of B.S. (1947), M.S. (1948), and D.Sc. (1950), all in physics, from Carnegie Institute of Technology.

He came to the Naval Research Laboratory in 1951 and has, as Head, Metal Physics Branch, Material Sciences Division, conducted and directed research on the physical properties of metallic alloys. Dr. Schindler has authored or coauthored over 90 papers in solid state physics on topics including galvanomagnetic effects in alloys, electronic specific heat of transition metals, and irradiation effects in magnetic materials. In this latter area, he holds several patents. He is an Adjunct Professor of Physics at Howard University, and has supervised thesis research there as well as at Catholic University, the University of Maryland, and American University. During a sabbatical year, Dr. Schindler was a visiting scientist at Imperial College of Science and Technology in London, England.

For his distinguished research Dr. Schindler has received numerous awards including the E.O. Hulbert Science Award for 1956, the National Capital Award in Applied Science for 1962, the 1965 Pure Science Award of the NRL Branch of the Scientific Research Society of America and the 1966 Award for Scientific Achievement presented by the Washington Academy of Science, and the Distinguished Achievement in Science Award, April 1975.

Dr. Schindler is a fellow of the American Physical Society and of the Washington Academy of Sciences. He also is a member of the Philosophical Society of Washington and Sigma Xi, the Scientific Research Society of North America. In this latter organization, Dr. Schindler was a member of the Board of Directors from 1974 to 1976.



Key Personnel

Name	*Title*
Dr. A.I. Schindler	Associate Director of Research for Materials and General Sciences
Mr. R. Nekritz	Special Assistant
Dr. J. Karle	Chief Scientist, Laboratory for Structure of Matter
Mr. L.A. Brauch	Head, Radiological and Environmental Protection Staff
Dr. F.E. Saalfeld	Superintendent, Chemistry Division
Dr. L.R. Hettche	Superintendent, Engineering Materials Division
Dr. A.I. Schindler*	Superintendent, Material Sciences Division
Dr. J. McElhinney	Superintendent, Radiation Technology Division

*Acting

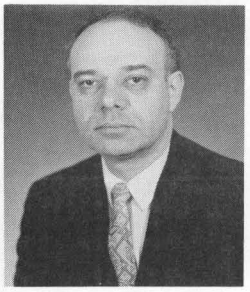
LABORATORY FOR STRUCTURE OF MATTER

Basic Responsibilities

The Laboratory for Structure of Matter carries out experimental and theoretical investigations of the atomic, molecular, glassy, and crystalline structures of materials. The methods of x-ray, electron, and neutron diffraction are used in a broad program of structure studies which can form the basis for understanding and interpreting the results of research investigations in a wide variety of scientific disciplines. Applications are made to device materials and other substances whose chemical and physical properties are of interest.

Key Personnel

Name	*Title*
Dr. J. Karle	Chief Scientist, Laboratory for Structure of Matter



Dr. J. Karle

Civilian Personnel

Full-Time Permanent: 10

Total Estimated R&D Funding

Fiscal Year 1977: $600,000

RADIOLOGICAL AND ENVIRONMENTAL PROTECTION STAFF

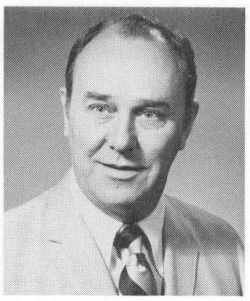
Basic Responsibilities

The Radiological & Environmental Protection Staff provides a Laboratory-wide protection program for the possession and use of all sources of ionizing radiation and microwave radiation. The Staff performs technical monitoring, evaluations, and research to assure that NRL radiological and microwave operations are safe and in compliance with federal, state, and Navy regulations. It provides employees with the instructions, instruments, assistance, and controls needed to carry out the protection responsibilities.

For environmental protection (pollution control) the Staff must: review Laboratory programs and plans to identify potential sources of pollution at NRL; recommend preventative or corrective measures necessary to reduce or eliminate unnecessary pollution; and monitor the air and water to determine compliance with applicable rules and regulations.

Key Personnel

Name	*Title*
Mr. L.A. Brauch	Head, Radiological & Environmental Protection Staff
Mr. T.L. Johnson	Head, Research Section
Mr. R.B. Luersen	Head, Accelerators & Analysis Section
Mr. J.N. Stone	Head, Pollution Control Section



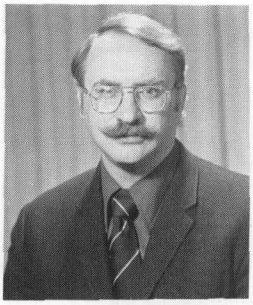
Mr. L. A. Brauch

Civilian Personnel

Full-Time Permanent: 15

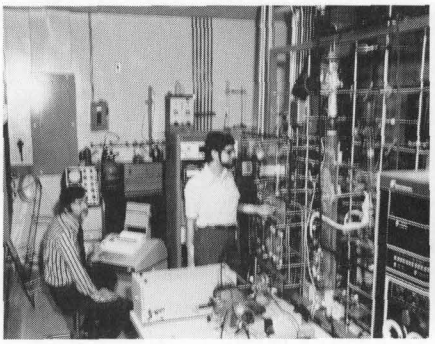
Total Estimated R&D Funding

Fiscal Year 1977: $500,000

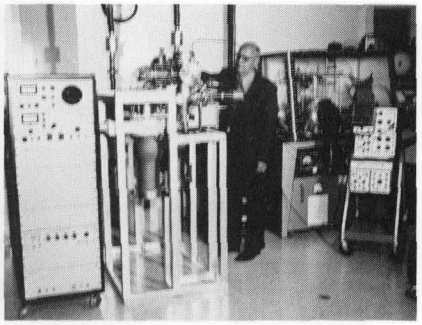


Dr. F. E. Saalfeld

Chemistry Division

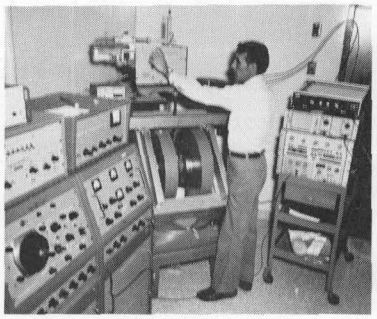


STUDY OF "COOL FLAMES'

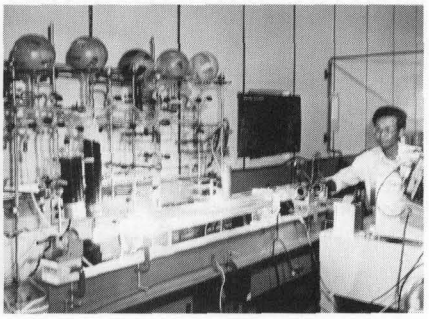


HIGH-TEMPERATURE MASS SPECTROMETER

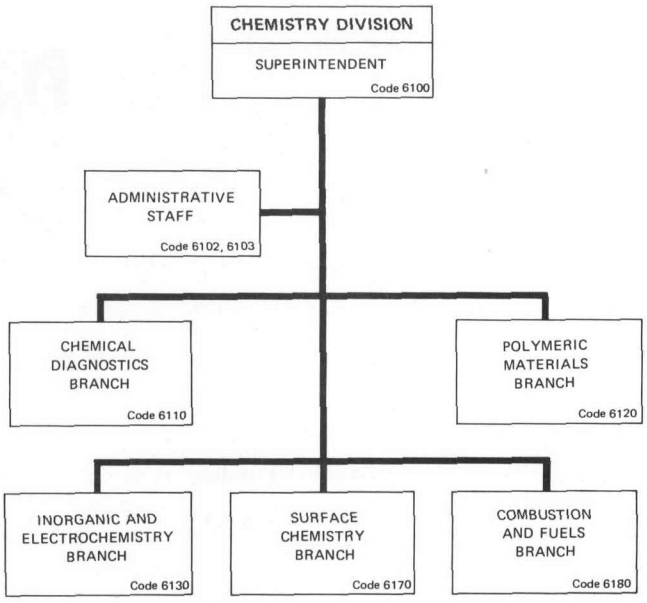
- CHEMICAL DIAGNOSTICS
- POLYMERIC MATERIALS
- INORGANIC AND ELECTROCHEMISTRY
- SURFACE CHEMISTRY
- COMBUSTION AND FUELS



FAST SCAN ELECTRON SPIN RESONANCE



CHEMICAL LASER



Basic Responsibilities

The Chemistry Division conducts basic and applied research and development studies in the broad fields of chemical diagnostics, polymeric materials, inorganic and electrochemistry, surface chemistry, and combustion and fuels chemistry. Specialized programs currently within these fields include lubricants, composite materials, coatings, adhesives, dynamics, chemical lasers, molecular structure determinations, submarine atmosphere analysis and control, corrosion, personnel protection, and fire suppression.

Branches

Chemical Diagnostics
- Optical diagnostics of chemical reactions
- Kinetics of gas phase reactions
- Chemical lasers and energy transfer
- Trace analysis
- Atmosphere analysis and control

Polymeric Materials
- Synthesis of unique polymers
- Functional organic coatings
- High-strength composites
- Photophysical processes in polymers
- Polymer characterization
- Adhesion and structural adhesives

Inorganic & Electrochemistry
- Solid state chemistry
- Fundamental electrode reactions
- Electrochemical power sources
- Solution chemistry

Inorganic & Electrochemistry (cont'd)
- Synthesis and characterization of novel inorganic compounds

Surface Chemistry
- Lubricants
- Surface properties of fibers
- Rheology
- Surface analysis
- Corrosion prevention

Combustion & Fuels
- Distillate fuels research
- Autoxidation and combustion dynamics
- Fire suppression
- Personnel protection in fires
- Modeling and scaling of combustion systems

Key Personnel

Name	*Title*
Dr. F.E. Saalfeld	Superintendent
Mrs. B.C. Gibbs	Administrative Officer
Dr. A.B. Harvey	Head, Chemical Diagnostics Branch
Dr. L.B. Lockhart, Jr. †	Head, Polymeric Materials Branch
Dr. W.B. Fox	Head, Inorganic & Electrochemistry Branch
Dr. N.L. Jarvis	Head, Surface Chemistry Branch
Dr. H.W. Carhart	Head, Combustion and Fuels Branch

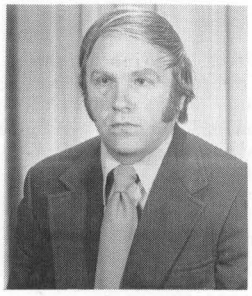
Civilian Personnel

Full-Time Permanent: 104

Total Estimated R&D Funding

Fiscal Year 1977: $8,000,000

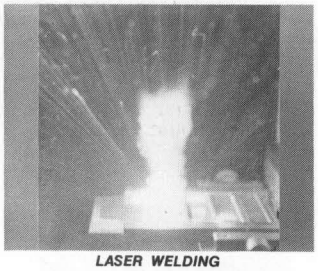
†Additional duty as Associate Superintendent



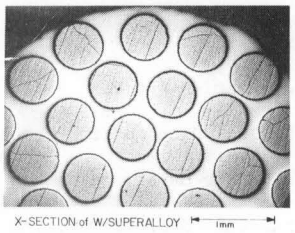
Dr. L. R. Hettche

Engineering Materials Division

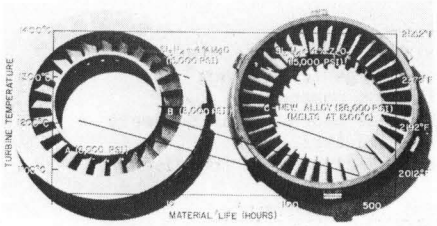
- ADVANCED MATERIALS TECHNOLOGY
- CERAMICS
- METALS PERFORMANCE
- THERMOSTRUCTURAL MATERIALS
- COMPOSITE MATERIALS



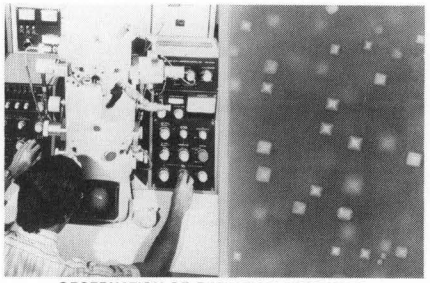
LASER WELDING



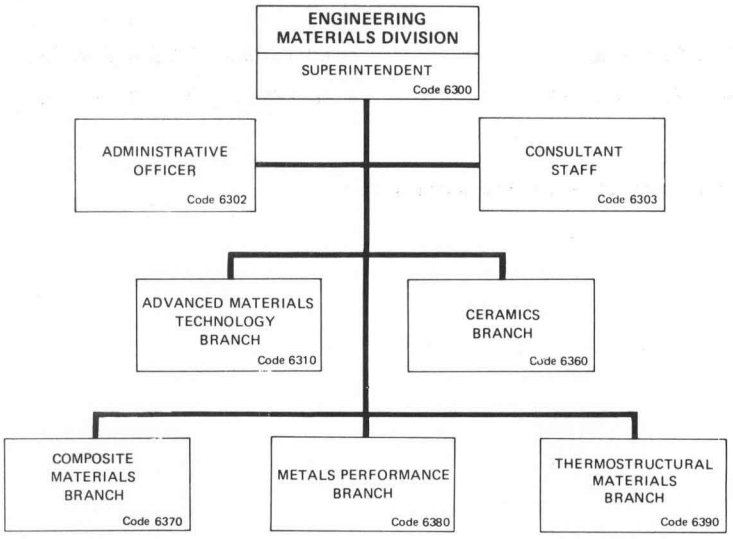
ADVANCED COMPOSITE MATERIALS FOR NAVAL APPLICATIONS



CERAMIC DEVELOPMENT FOR THERMOSTRUCTURAL AND DEVICE APPLICATIONS



OBSERVATION OF RADIATION PRODUCED MICROVOIDS (500 Å DIA) IN METALS



Basic Responsibilities

The Engineering Materials Division is concerned with basic and applied research in the advanced characterization and development of materials for naval structures and devices. Emphasis is given to the effects of composition, processing, and microstructure on the service performance of metals, alloys, ceramics, and composites, particularly the strength and fracture behaviors of these materials in benign, corrosive, and radiation environments. Analytical considerations range from engineering reliability procedures to mechanistic modeling of microseparation processes. Other interests include thermomechanical shock response, high-temperature effects and equation-of-state, ballistic phenomena, and piezoelectric applications. This diversity of activities is carried out by an interdisciplinary staff of material scientists, metallurgists, ceramists, physicists, chemists, and engineers, utilizing the most advanced testing and diagnostic facilities.

Branches

Advanced Materials Technology
- Microstructural characterization
- Weldability of advanced alloys
- Thermomechanical effects
- Micromechanisms of crack growth
- Novel fabrication and processing

Ceramics
- Processing and fabrication
- Microstructural development and characterization
- Strength and fracture behavior
- Plastic deformation; study and application
- Ceramics for electronic, piezoelectric, optical, and other nonmechanical applications

Metals Performance
- Subcritical crack growth and fracture
- Failure-safe design parameters
- Metallurgical optimization for high-strength metals
- Corrosion science related to advanced alloys
- Marine corrosion and cathodic protection

Thermostructural Materials
- Elevated temperature behavior of materials
- Influence of environment on high-temperature materials
- Basic mechanisms of radiation damage
- Criteria for improved structural design using high-temperature materials

Composite Materials
- Physical, mechanical and failure characterizations
- Fabrication and processing techniques
- Mechanical and failure analyses
- High-temperature structural and ordnance applications

Key Personnel

Name	*Title*
Dr. L.R. Hettche	Superintendent
Mrs. E.J. Elwell	Administrative Officer
Mr. C.D. Beachem	Head, Advanced Materials Technology Branch
Mr. R.W. Rice	Head, Ceramics Branch
Dr. S.C. Sanday	Head, Composite Materials Branch
Mr. R.J. Goode	Head, Metals Performance Branch
Mr. L.E. Steele†	Head, Thermostructural Materials Branch

Civilian Personnel

Full-Time Permanent: 78

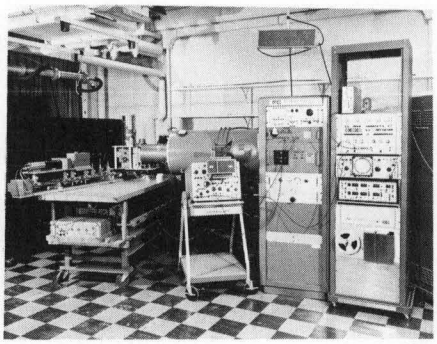
Total Estimated R&D Funding

Fiscal Year 1977: $5,700,000

†Additional duty as Associate Superintendent

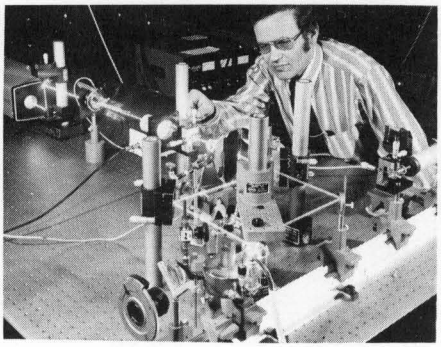
Dr. A. I. Schindler*

Material Sciences Division



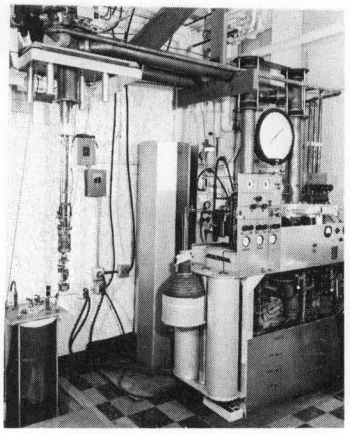
EXPERIMENT FOR NANOSECOND IRRADIATION OF MATERIALS AND TRANSIENT OPTICAL MEASUREMENTS

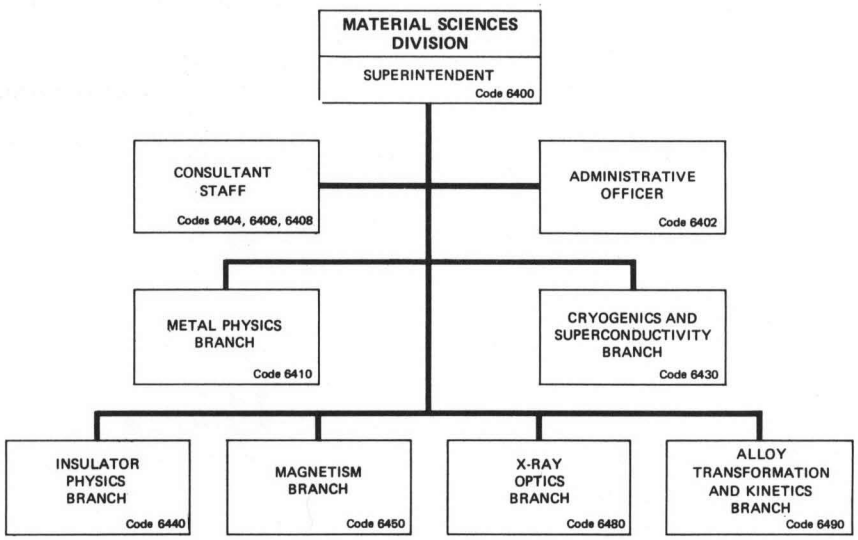
- METAL PHYSICS
- CRYOGENICS AND SUPERCONDUCTIVITY
- INSUALTOR PHYSICS
- MAGNETISM
- X-RAY OPTICS
- ALLOY TRANSFORMATIONS AND KINETICS



HOLOGRAPHY SET-UP WITH PHOTODICHROIC MATERIALS

DILUTION REFRIGERATOR WITH DIAMOND ANVIL PRESSURE CELL





*Acting

Basic Responsibilities

The Material Sciences Division conducts basic and applied research and engages in exploratory and advanced development of broad categories of materials having substantive scientific and/or technological interest to the Navy. R&D programs emcompass the full range of materials, i.e., from metallics to insulators, from simple crystalline solids to complex polymeric substances. Program objectives include achieving enhanced fundamental understanding of the physical properties and phenomena displayed by materials pursuant to improved control and application in advanced naval systems, thereby providing a corps of scientific materials experts for the Laboratory and the Navy. Programs are pursued on interesting and important resistive, superconducting, insulating, and magnetic materials, with investigations on all levels from the quantum mechanical to the microstructural. Exploitable phenomena in materials such as phase transformations, latice defects, x-ray production, and interactions with magnetic, electromagnetic, thermal, and radiation fields are of interest and under investigation by various groups within the Division. Representative of current divisional programs are: laser/materials interactions and responses, magnetic and photochromic memories in solids, glass-fiber optical materials, ultrasensitive magnetic detectors and low-frequency radio detectors, submarine magnetization, x rays for environmental monitoring, and development of practical high-temperature high-field superconductors for motors and generators. Application areas of these and other divisional programs cover immense areas of naval technology and underscore the unique expertise and broad purview of the Division.

Branches

Metal Physics
- Electronic and magnetic properties
- Thermal and optical properties
- Laser material interactions
- Optical radiation vulnerability
- Magnetostriction
- Advanced structural materials

Cryogenics and Superconductivity
- High-pressure effects
- Superconducting materials
- Superconducting electronics

Insulator Physics
- Electronic properties of nonmetallic crystals and glasses
- Radiation-induced defects, color centers
- Optical properties: fibers, windows, data processing materials

Magnetism
- Resonance in magnetic materials
- Spin-ordered magnetic phenomena
- Rare earth - transition metal magnetic materials
- Magnetic properties of amorphous materials

X-Ray Optics
- X-ray spectrochemical analysis
- X-ray diffraction
- Band structure and superconductivity
- Plasma diagnostics

Alloy Transformations and Kinetics
- Phase transformations
- Crystalline defect states
- Microstructural effects in superconductors
- Elasticity, plasticity, mechanical phenomena

Key Personnel

Name	*Title*
Dr. A.I. Schindler*	Superintendent
Mrs. A.K. Hayden	Administrative Officer
Dr. H.B. Rosenstock	Consultant Staff: Theory
Dr. M. Hass	Consultant Staff: Experiment
Dr. F.W. Patten	Consultant Staff: Technical Liaison
Dr. J.T. Schriempf	Head, Metal Physics Branch
Dr. R.A. Hein	Head, Cryogenics and Superconductivity Branch
Dr. M.N. Kabler	Head, Insulator Physics Branch
Dr. G.T. Rado	Head, Magnetism Branch
Mr. L.S. Birks	Head, X-Ray Optics Branch
Dr. B.B. Rath	Head, Alloy Transformations and Kinetics Branch

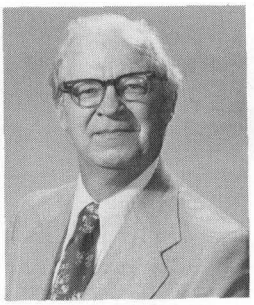
Civilian Personnel

Full-Time Permanent: 101

Total Estimated R&D Funding

Fiscal Year 1977: $6,800,000

*Acting

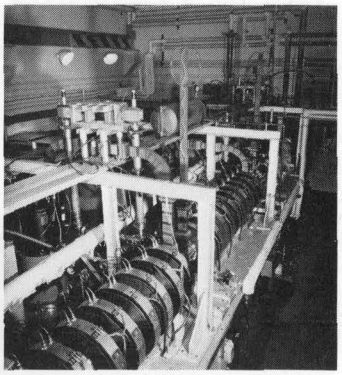


Dr. J. McElhinney

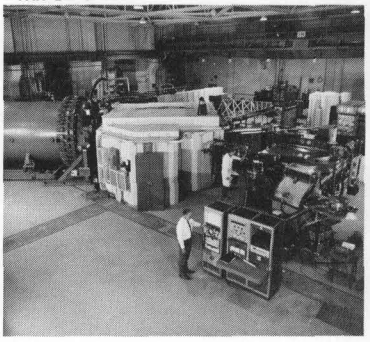
Radiation Technology Division

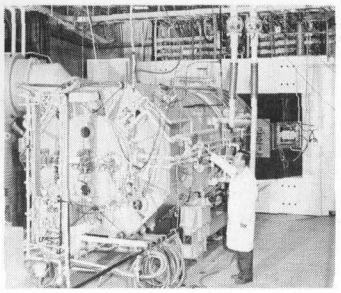
- RADIATION EFFECTS
- RADIOBIOLOGY
- RADIATION-MATTER INTERACTION
- MATERIALS MODIFICATION AND ANALYSIS

LINAC

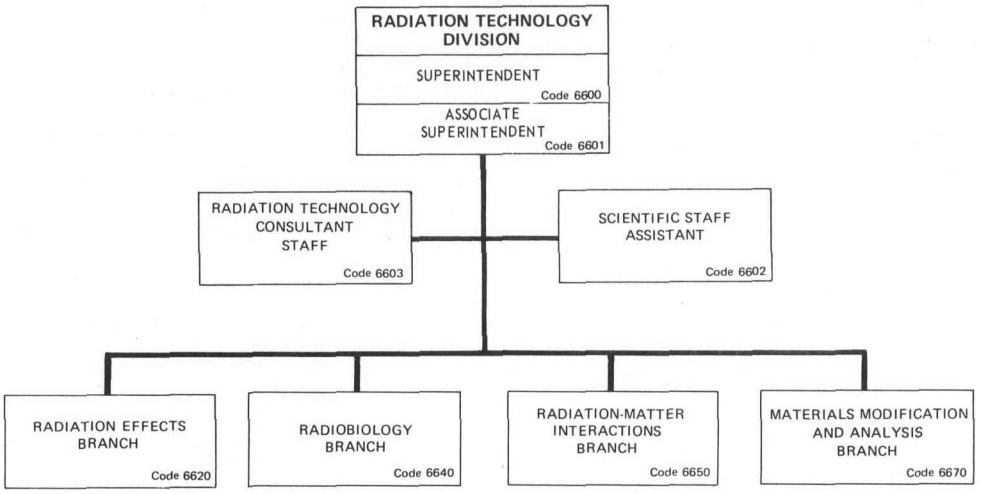


VAN DE GRAAFF





CYCLOTRON



Basic Responsibilities

The Radiation Technology Division conducts a broad program of basic and applied research in radiation technology and related areas. Both theoretical and experimental research are performed in areas such as: radiation sources, accelerators, radiation detection and analysis, radiation dosimetry, interaction of various radiations with materials and devices, vulnerability of military equipment to radiations, modification of materials by radiations, analysis of materials by radiations, biomedical applications of radiations, and advanced nuclear power sources. Major facilities include: a 75-MeV sector-focusing cyclotron, a 60-MeV electron Linac, a 5-MV Van de Graaff, and several smaller radiation sources.

Staff Activities

Consultant Staff
- Radiation instrumentation
- Ion-solid interactions
- Radiation detection
- Radiation theory

Branches

Radiation Effects
- Radiation effects on infrared detectors, optical and electronic materials, and satellite components
- Solar cells
- Radiation belts
- Hardening satellite components against laser beams
- Radiation vulnerability
- Radiation curing of polymers
- Photographic Image Enhancement

- 2-MV electron Van de Graaff
- Cobalt-60 source
- 60-MeV electron Linac

Radiobiology
- Radiations for biological and medical purposes
- Neutron beams for cancer therapy
- Radioisotope production
- Ion-induced x rays

- 75-MeV cyclotron

Radiation - Matter Interactions
- Measurements on targets bombarded by MeV electron beams
- Deposition of energy by charged particles
- Neutron transport
- Neutron reactions in tissue resident elements
- Initiation of explosives by electron beam

Materials Modification and Analysis
- Materials analysis by means of charged-particle beams
- Implantation of ions into solids
- Radiation effects caused by high-energy charged-particle beams
- Radiation damage in reactor materials
- Crystal studies by means of particle channeling techniques
- Ion-induced x rays
- Modification of surface and subsurface properties by ion implantation

- 5-MV Van de Graaff

Key Personnel

Name	*Title*
Dr. J. McElhinney	Superintendent
Dr. E.A. Wolicki	Associate Superintendent
Mr. H.J. Quinn	Scientific Staff Assistant
Mr. D.C. Cook	Consultant (Radiation Instrumentation)
Dr. K.L. Dunning	Consultant (Ion-Solid Interactions)
Dr. K.W. Marlow	Consultant (Radiation Detection)
Dr. A.W. Saenz	Consultant (Radiation Theory)
Dr. B.J. Faraday	Head, Radiation Effects Branch
Dr. R.O. Bondelid	Head, Radiobiology Branch
Dr. J.B. Aviles	Head, Radiation-Matter Interaction Branch
Dr. J.W. Butler	Head, Materials Modification and Analysis Branch

Civilian Personnel

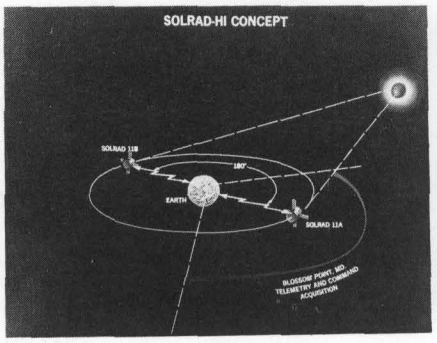
Full-Time Permanent: 74

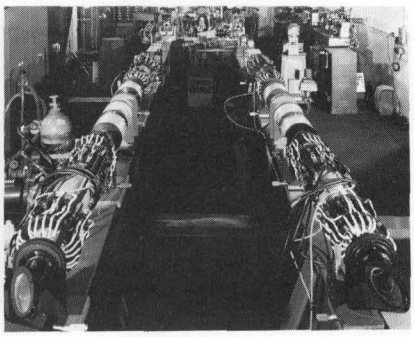
Total Estimated R&D Funding

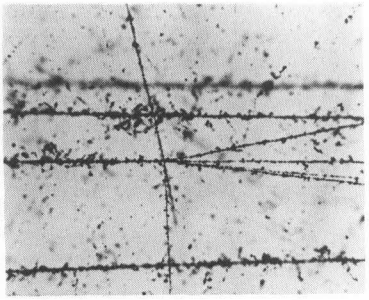
Fiscal Year 1977: $5,200,000

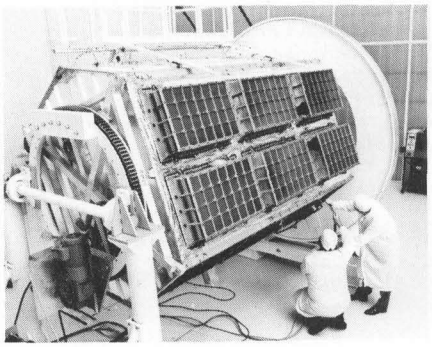
Space Science and Technology Area

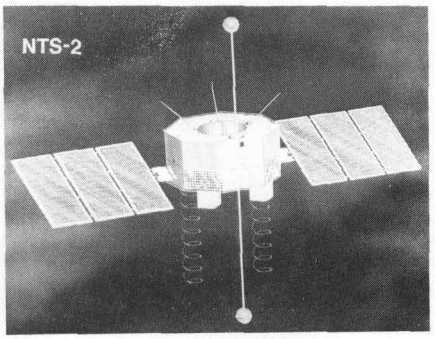
The Naval Research Laboratory conducts basic and applied research in upper air physics, astronomy, and astrophysics to improve naval capabilities in communications, navigation, detection, surveillance, and other fields; the investigations are made by means of several radio telescopes and a wide variety of space probes. Both experimental and theoretical techniques are used to conduct plasma research, to understand more fully natural and man-made plasma phenomena, and to develop controlled thermonuclear power sources. The area is involved also in the study and application of advanced mathematical techniques and in the many approaches afforded by the computer sciences.



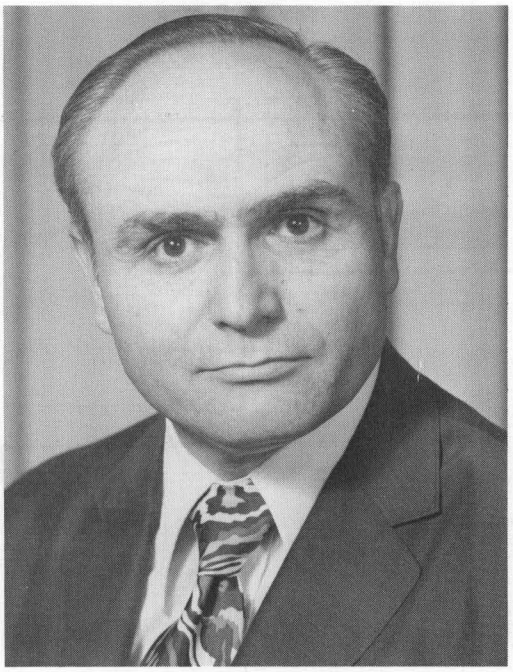








Associate Director of Research for Space Science and Technology



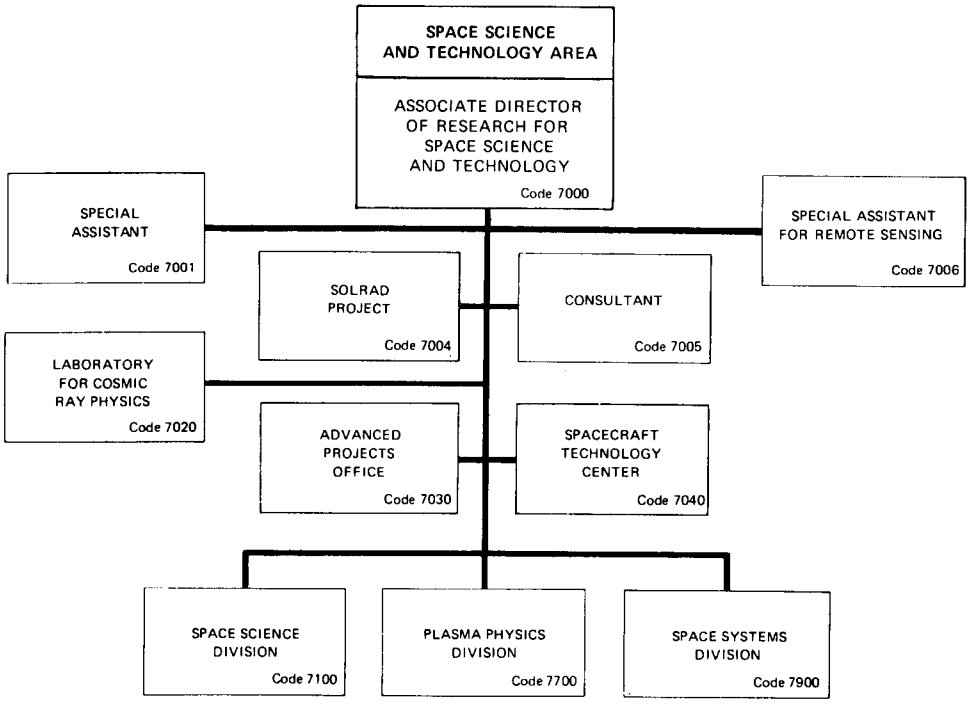
Dr. Herbert Rabin

Dr. Rabin [redacted] He received a B.S. degree in physics from the University of Wisconsin in 1950, an M.S. degree in physics from the University of Illinois in 1951, and a Ph.D. degree in physics from the University of Maryland in 1959.

He has been employed at the Naval Research Laboratory since 1952, working in the fields of high-energy gamma-ray and electron facilities, radiation dosimetry, solid state studies of lattice defects, and nonlinear optics and laser physics. In these research areas Dr. Rabin has authored or coauthored well over a hundred papers and conference presentations. Dr. Rabin currently serves as a coeditor of a series of technical volumes on quantum electronics. In addition, Dr. Rabin holds six patents.

Prior to his present appointment, Dr. Rabin held several supervisory positions at NRL, the most recent being Head, Quantum Optics Branch, Optical Sciences Division. He has taught courses in the Physics Department at George Washington University; he was a visiting scientist at the Technische Hochschule in Stuttgart, Germany; and he was a consultant to the school of Engineering of the University of Sao Paulo, Sao Carlos, Brazil, under sponsorship of the Pan American Union.

Dr. Rabin is a Fellow of the American Physical Society and holds membership in the Optical Society of America, the Philosophical Society of Washington, the American Association for the Advancement of Science, the American Institute of Aeronautics and Astronautics, and several honorary societies. He is also a corresponding member of the Brazilian Academy of Sciences. Dr. Rabin received the Navy Meritorious Civilian Service Award in 1969, the E.O. Hulburt Annual Science Award in 1970, and the Navy Distinguished Civilian Service Award in 1976.



Key Personnel

Name	*Title*
Dr. H. Rabin	Associate Director of Research for Space Science and Technology
Mr. J.M. Shaw, Jr.	Special Assistant
Mr. E.W. Peterkin	SOLRAD Project Manager
Dr. J.W. Schwartz	Consultant
Dr. V.E. Noble	Special Assistant for Navy Environmental Remote Sensing
Dr. M.M. Shapiro	Head, Laboratory for Cosmic Ray Physics
Mr. R.D. Mayo	Head, Advanced Projects Office
Mr. P.G. Wilhelm	Head, Spacecraft Technology Center
Dr. H. Friedman	Superintendent, Space Science Division
Dr. T. Coffey	Superintendent, Plasma Physics Division
Mr. N.W. Guinard	Superintendent, Space Systems Division

LABORATORY FOR COSMIC RAY PHYSICS

Basic Responsibilities

The Laboratory for Cosmic Ray Physics conducts several interrelated programs: (a) investigating the high-energy radiation environment at satellite orbits and at altitudes of high-flying airplanes, (b) determining radiation damage to men, electronic components, and materials, using high-energy heavy-ion accelerators, (c) studying neutrino interactions, and (d) exploring the acoustic detection of charged particles. Program (a) includes studies of the nature and interactions of both solar-flare and galactic high-energy particles. In Program (b) the nuclear fragmentations and energy deposition in biological tissue-like materials are investigated; this work yields data for exploratory heavy-ion cancer therapy. Energetic heavy ions are also used to simulate neutron damage to components and materials of future high-flux reactors. The entire program is designed to be responsive to anticipated technical requirements of the Navy and the general research and development program of the Department of Defense.

Key Personnel

Name	*Title*
Dr. M.M. Shapiro	Chief Scientist, Laboratory for Cosmic Ray Physics
Mr. N. Seeman	Senior Scientist
Dr. R. Silberberg	Senior Scientist
Mr. F.W. O'Dell	Senior Scientist

Dr. M. M. Shapiro

Civilian Personnel

Full-Time Permanent: 12

Total Estimated R&D Funding

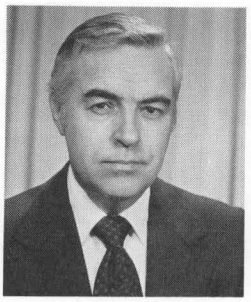
Fiscal Year 1977: $ 540,000

SOLRAD PROJECT

The SOLRAD Project was established to support NAVELEX advanced development tasks in solar x-ray monitoring and specifically to (a) develop, construct, test, evaluate, and provide launch support of SOLRAD satellites; (b) track, command, and acquire satellite telemetry; and (c) reduce, analyze, and transmit solar emission data for scientific and application purposes.

Key Personnel

Name	*Title*
Mr. E.W. Peterkin	Technical Project Manager
Mr. R.W. Kreplin	Scientific Program Manager
Mr. D.M. Horan	Experiments Manager
Mr. P.G. Wilhelm	Assistant Project Manager (Spacecraft)
Mr. J.G. Winkler	Spacecraft Manager
Mr. J.M. Goodman	Assistant Project Manager (Data Processing)
Mr. A.J. Martin	Data Processing Coordinator



Mr. E. W. Peterkin

Manpower Support

8 man-years

Total Estimated R&D Funding

Fiscal Year 1977: $1,200,000

ADVANCED PROJECTS OFFICE

Basic Responsibilities

The Advanced Projects Office has NRL Program Management responsibility for an advanced space project. This involves system concept generation, system design, design implementation, fabrication, testing, and deployment of the total space system which includes both the operational overseas data collection systems as well as the satellite payloads. In addition, systems analysis, mathematical modeling, technical system integration, and operational evaluation of advanced space/ground systems is performed. The Advanced Projects Office also develops Future System Concepts and Future System Proposals and Designs in the areas of Space Science and Technology.

Systems Development Branch
- System Studies Section
- Systems Design Section
- Systems Implementation Section
- Flight Systems Section

Systems Engineering & Integration Branch
- Management & Liaison Section
- System Engineering Management Section
- Advanced Analysis Section

Mr. R. D. Mayo

Key Personnel

Name	*Title*
Mr. R.D. Mayo	Manager, Advanced Projects Office
Ms. L.P. Harding	Administrative Officer
Mr. F.V. Hellrich	Head, Systems Development Branch
Mr. L.M. Hammarstrom	Head, Systems Engineering & Integration Branch

Civilian Personnel

Full-Time Permanent: 55

Total Estimated R&D Funding

Fiscal Year 1977: $12,300,000

SPACECRAFT TECHNOLOGY CENTER

Basic Responsibilities

The Spacecraft Technology Center is responsible for providing complete spacecraft systems for purposes of conducting research and development in the space environment. This involves a broad and complete spectrum of activities ranging from system concept formulation, preliminary and detailed design, and prototype development to complete flight systems. The Center maintains all of the necessary special facilities for aerospace-type fabrication and environmental testing and the expertise which is generally required in the spacecraft system. The Center also maintains dedicated ground stations for the purpose of transmitting command/control signals to, and receiving and analyzing telemetered data from, those of its spacecraft which have been placed into orbit.

Key Personnel

Name	*Title*
Mr. P.G. Wilhelm	Head, Spacecraft Technology Center
Mrs. B.L. Murphy	Administrative Officer
Mr. A.C. Salvato	Product Assurance Section
Mr. R.T. Beal	Mechanical Systems Section
Mr. R.S. Rovinski	Structures Design Section
Mr. F.W. Raymond	Engineering Physics Section
Mr. J.G. Winkler	Power Systems Section
Mr. L.E. Hearton	R. F. Systems Section
Mr. R.E. Eisenhauer	Digital Systems Section

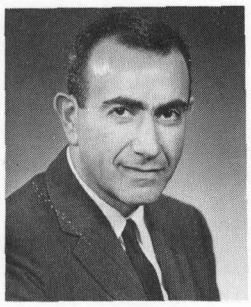
Mr. P. G. Wilhelm

Civilian Personnel

Full-Time Permanent: 67

Total Estimated R&D Funding

Fiscal Year 1977: $ 15,000,000



Dr. H. Friedman

Space Science Division

- ADVANCED SPACE SENSING APPLICATIONS
- UPPER AIR PHYSICS
- RADIO ASTRONOMY
- ROCKET SPECTROSCOPY

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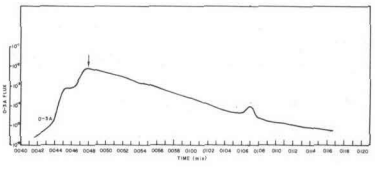
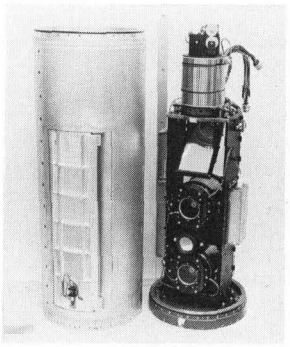
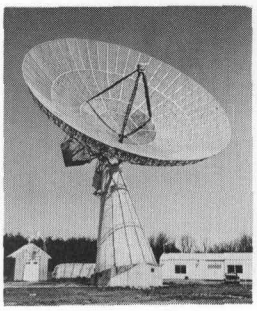
- E.O. HULBURT CENTER FOR SPACE RESEARCH



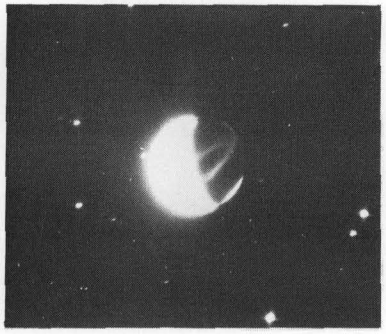
GROWTH AND DECAY OF X-RAYS FROM A SOLAR FLARE



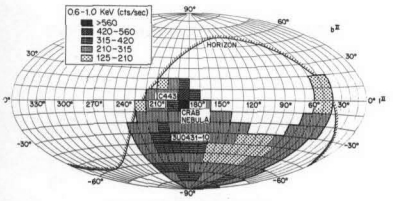
ROCKET PAYLOAD FOR UV OBSERVATION OF COMET



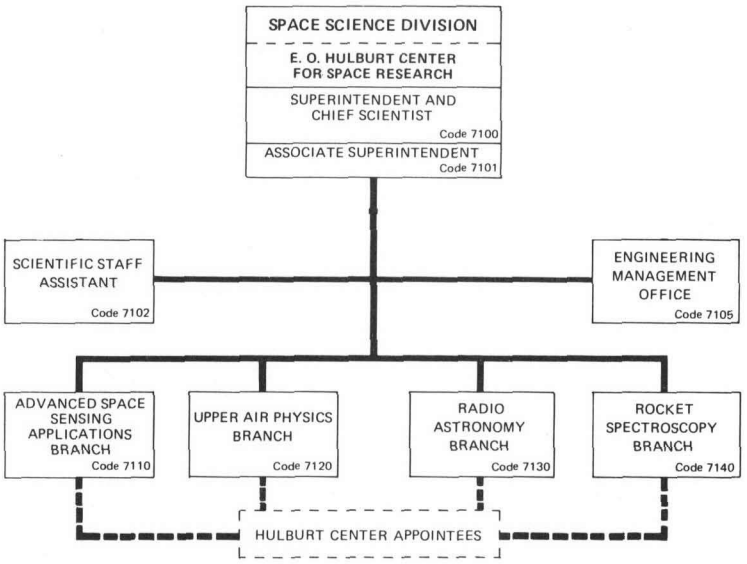
RADIO TELESCOPE MARYLAND POINT



FAR-ULTRAVIOLET PHOTOGRAPH OF EARTH



X-RAY INTENSITY MAP OF THE OBSERVED SKY



Basic Responsibilities

The Space Science Division conducts research, development, and tests in the fields of upper air physics, astronomy, astrophysics, and remote geosensing. Satellites and rockets are used to obtain information on radiation from the sun and celestial sources, to study the composition and behavior of the ionosphere, and to sense remotely the terrestrial environment. Radio telescopes are used for astronomical observations. Results are of importance to radio communications, to utilization of the space environment, and to the fundamental understanding of natural radiation phenomena.

Branches

Advanced Space Sensing Applications
- Active and passive sensor development for remote sensing
- Satellite radar altimetry
- Remote sensing of ocean environment and surface properties
- Remote sensing of arctic conditions
- Determining volume of oil spills at sea

Upper Air Physics
- Gamma-ray, x-ray, ultraviolet, and infrared astronomy
- Aeronomy
- Solar x-ray monitoring satellites
- Electronic imaging studies
- Meteor astronomy

Radio Astronomy
- Galactic and extragalactic radio astronomy
- VLBI (very long baseline interferometry)

Radio Astronomy (continued)
- Intergalactic gases
- Atmospheric radiation
- Extraterrestrial radio radiation

Rocket Spectroscopy
- X-ray and ultraviolet solar spectroscopy
- Spectroheliographic and coronagraphic research
- Solar-terrestrial relationships
- XUV spectroradiometry
- Apollo telescope mission solar research

E.O. Hulburt Center for Space Research

The program is that of the four combined branches. It allows graduate and postgraduate students and visiting faculty members to cooperate with NRL in space research.

Key Personnel

Name	*Title*
Dr. H. Friedman	Superintendent
Dr. P. Mange	Associate Superintendent
Mr. W. Conway*	Scientific Staff Assistant
Mr. B. Yaplee	Head, Advanced Space Sensing Application Branch
Dr. T.A. Chubb	Head, Upper Air Physics Branch
Mr. C.H. Mayer	Head, Radio Astronomy Branch
Dr. R. Tousey	Head, Rocket Spectroscopy Branch
Dr. H. Friedman	Chief Scientist, Hulburt Center

Civilian Personnel

Full-Time Permanent: 137

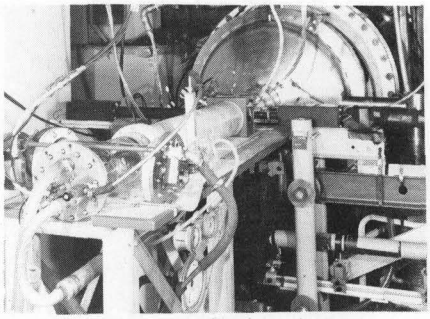
Total Estimated R&D Funding

Fiscal Year 1977: $9,500,000

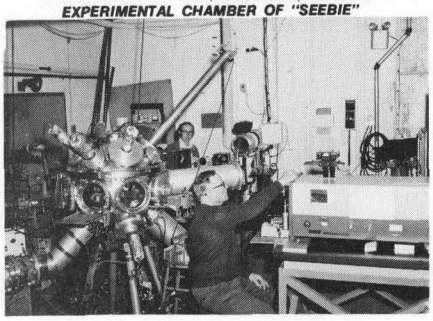
*Acting

Dr. Timothy Coffey

Plasma Physics Division

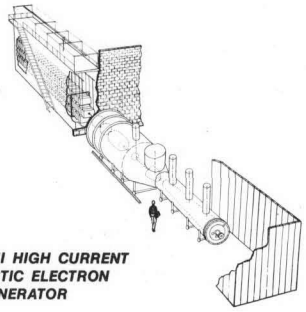


EXPERIMENTAL CHAMBER OF "SEEBIE"

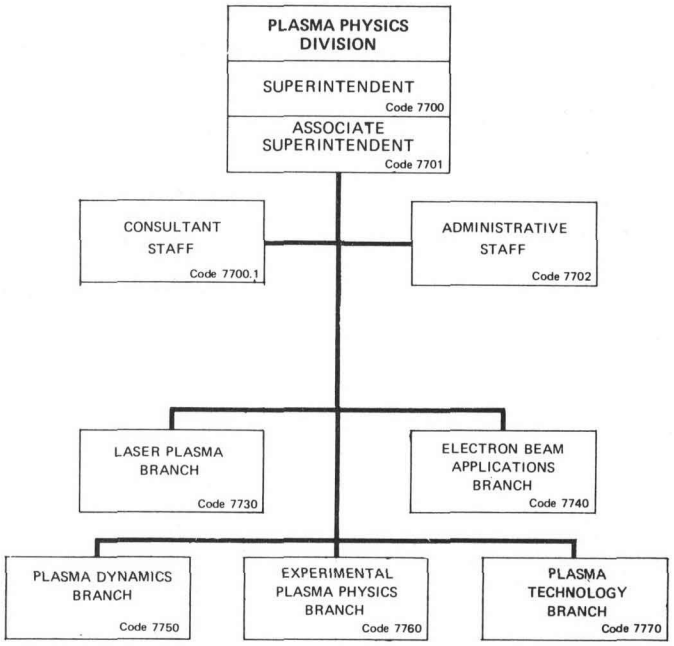


LASER PLASMA EXPERIMENT

- **LASER PLASMA INTERACTION**
- **ELECTRON BEAM APPLICATIONS**
- **PLASMA DYNAMICS**
- **EXPERIMENTAL PLASMA PHYSICS**
- **PLASMA TECHNOLOGY**



GAMBLE II HIGH CURRENT RELATIVISTIC ELECTRON BEAM GENERATOR



Basic Responsibilities

The Plasma Physics Division conducts both basic and applied experimental and theoretical research. Examples of efforts underway include: fusion physics and the generation and containment of high-temperature plasmas, laser-produced plasmas, the behavior of the ionosphere as a partial plasma, electron and ion beam experiments, simulation of high-altitude nuclear weapons effects by pulsed radiation devices, and numerical simulation techniques through the use of the NRL Advanced Scientific Computer.

Branches

Electron Beam Applications
- Application of high-current relativistic electron beams to microwave and millimeter wave generation
- Electron and ion beam weapons concepts

Experimental Plasma Physics
- Seven-ohm plasma experiment
- SEEBIE electron beam plasma
- CUSP plasma preheating experiment
- Theory/system modeling
- Experimental study of plasma chemistry

Laser Plasma
- Laser-plasma interaction
- Laser fusion
- Plasma diagnostics

Large glass laser facility

Plasma Dynamics
- Theoretical and numerical simulation studies of problems in nonlinear plasma dynamics
- Ionospheric modeling
- Numerical simulation of high-density plasmas
- Geophysical fluid dynamics

Plasma Technology
- Production of intense relativistic electron beams
- Electron beam propagation and focusing
- Experimental research in high-power exploding wires
- Generation of intense ion beams
- Inductive energy storage
- Magnetic flux compression

Key Personnel

Name	*Title*
Dr. T. Coffey	Superintendent
Mr. J.D. Brown	Associate Superintendent
Ms. B.D. Bassford	Administrative Officer
Dr. A. Robson	Coordinator, CTR Program
Dr. W. Ali	Consultant
Dr. K. Hain	Consultant
Dr. K. Papadopoulos	Consultant
Dr. J. Shipman	Consultant
Dr. S. Bodner	Head, Laser Plasma Branch
Dr. T. Coffey*	Head, Electron Beam Applications Branch
Dr. J. Boris	Head, Plasma Dynamics Branch
Dr. A. Robson	Head, Experimental Plasma Physics Branch
Dr. P. Turchi	Head, Plasma Technology Branch

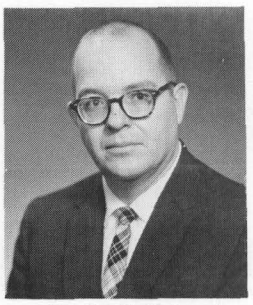
Civilian Personnel

Full-Time Permanent: 109

Total Estimated R&D Funding

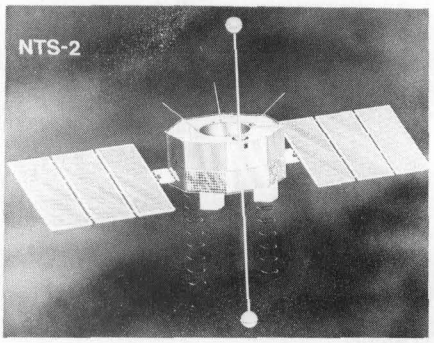
Fiscal Year 1977: $9,700,000

*Acting



Mr. N. W. Guinard

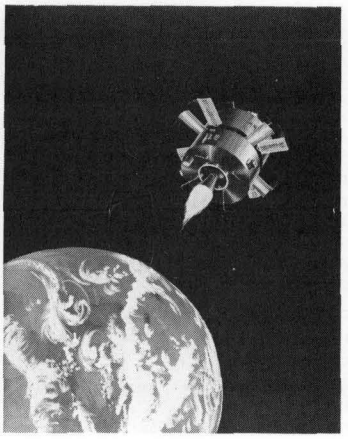
Space Systems Division

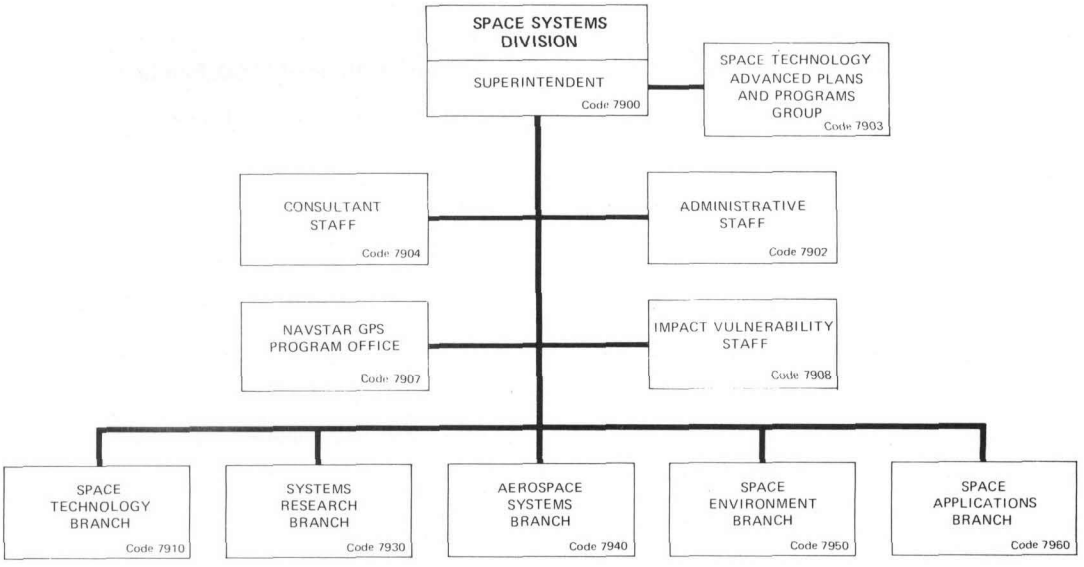


- SPACE TECHNOLOGY
- AEROSPACE SYSTEMS
- SPACE APPLICATIONS
- SPACE ENVIRONMENT
- SYSTEMS RESEARCH

GACT

SOLRAD HI





Basic Responsibilities

The Space Systems Division is responsible for research and development leading to the design, fabrication, launch, operation, and support of space systems for the Navy. The application of space technology to the naval mission extends through all of the R&D spectrum from concept formulation to launch techniques of the completed spacecraft and interface with boosters. Both active and passive sensor technology are developed for space use. The Division is also responsible for R&D in environmental problem areas which affect the operation and performance of these space vehicles and for sharing the results with other related activities.

Staff Activities

Impact Vulnerability
- Vulnerability Mechanics
- Hypervelocity Kill Machine
- Hypervelocity Impact Mechanics

Advanced Plans and Programs Group
- Project support
- Systems engineering
- Systems analyses
- Data processing

NAVSTAR GPS Program Office
- Navigation
- Geodesy
- Time Synchronization

Branches

Space Technology
- Large parabolic antenna systems
- Electromagnetic radiation observations
- Special media propagation
- Electromagnetic exosphere phenomena

Systems Research
- Image processing research
- Radiative transfer
- Potential theory applications
- Space mission analysis
- Military OR methods
- Formula manipulation on computers

Aerospace Systems
- Ocean surveillance
- Electromagnetic scatter research
- Propagation research
- O/S display systems

Aerospace Systems (continued)
- Satellite system research
- Data systems
- Automatic computations

Space Environment
- Space environment
- Ionospheric predictions
- Radio-wave propagation
- Data processing
- Computer simulation
- Solar-terrestrial relationships

Space Applications
- Navigation systems
- Satellite tracking
- Geodesy systems
- Time synchronization
- System analysis
- Hydrogen maser

Key Personnel

Name	*Title*
Mr. N.W. Guinard	Superintendent
Mr. B. Dodson*	Associate Superintendent
Mrs. S.M. Randleman	Administrative Officer
Mr. P.E.V. Shannon*	Head, Advanced Plans and Programs Group
Dr. H.W. Gandy	Special Assistant
Dr. P. Lanzano	Senior Research Scientist
Dr. K.T. Alfriend	Head, Technical Staff
Mr. R.L. Easton	Manager, NAVSTAR GPS Program
Mr. W.W. Atkins	Head, Impact Vulnerability Staff
Mr. J.H. Trexler	Head, Space Technology Branch
Dr. A.F. Petty	Head, Systems Research Branch
Mr. H.O. Ankenbruck	Head, Aerospace Systems Branch
Dr. J.M. Goodman	Head, Space Environment Branch
Mr. R.L. Easton	Head, Space Applications Branch

Civilian Personnel

Full-Time Permanent: 113

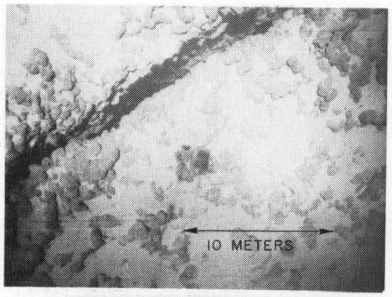
Total Estimated R&D Funding

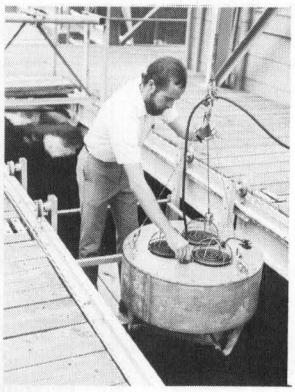
Fiscal Year 1977: $11,100,000

*Acting

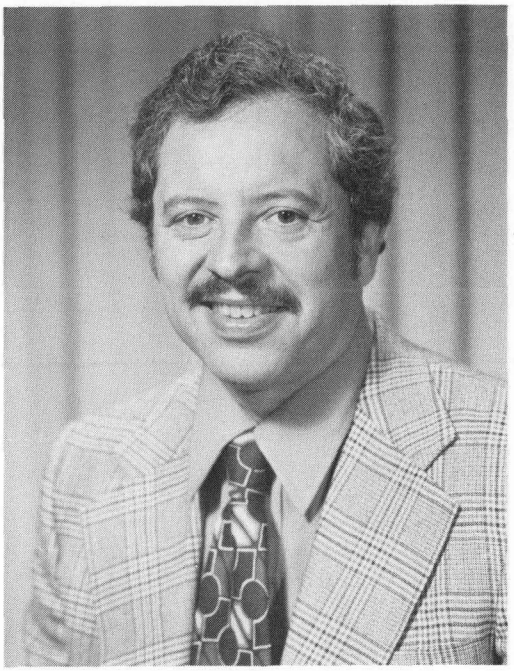
Oceanology Area

The Naval Research Laboratory conducts research at sea and in the Laboratory in the fields of underwater acoustics, oceanography, marine geophysics, atmospheric physics, and ocean engineering and technology. Subjects of investigation include antisubmarine warfare, acoustic propagation and scattering, ambient noise in the ocean, signal processing, marine and atmospheric pollution, instrumentation systems for deep ocean search and inspection, and methods of design and installation of structures and apparatus for use in the ocean. NRL also serves as the focal point in the Navy for standardization of underwater sound measurements, and holds a major responsibility for research and development in undersea acoustic surveillance.





Associate Director of Research for Oceanology



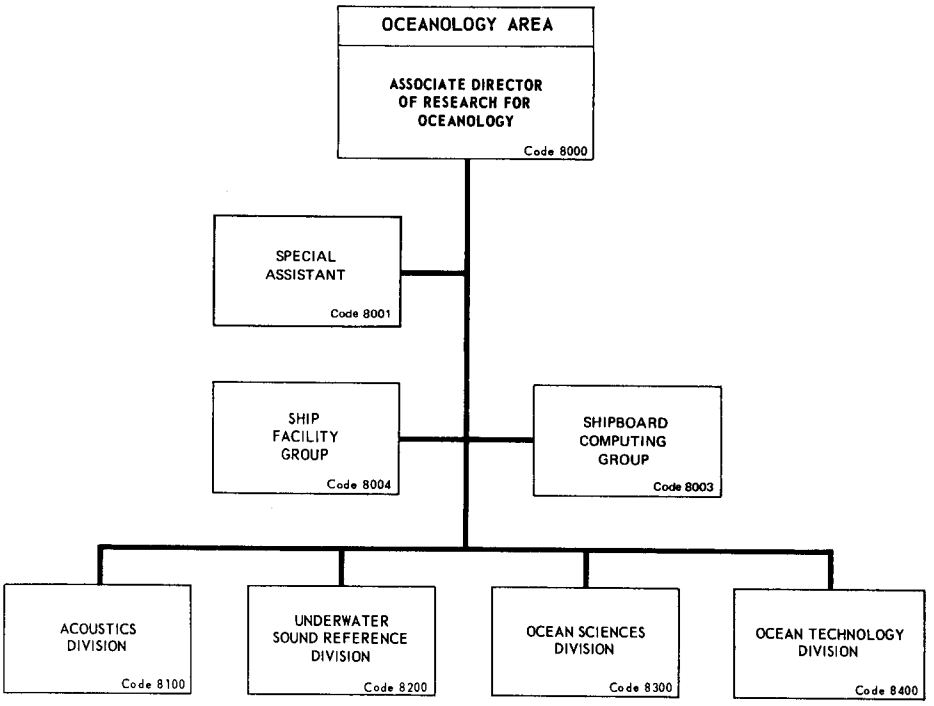
Mr. Richard R. Rojas

Mr. Rojas [redacted] He attended the College of the City of New York, where in 1952 he received a BEE degree. In 1961 he received a MEE degree from Drexel Institute of Technology, Philadelphia. Further graduate studies in mathematics and engineering were taken at the University of Pennsylvania, Philadelphia.

From 1952 to 1960, Mr. Rojas was a project engineer in the Missile Department at Philco Corporation where he participated in the TALOS, TERRIER, and TARTAR missile fuze programs, and the Terrier missile guidance project. While at Philco, he received a company achievement award for his work on the design of specialized missile test equipment. From 1960 to 1969 he was manager of the Hydroacoustics Department at the Magnavox General Atronics Corporation. At General Atronics he was active in the area of signal processing techniques as applied to sonar, communication systems, and seismic detection systems. In 1969, he joined the Naval Research Laboratory as Head of the Advanced Undersea Surveillance Program. In this capacity he had the responsibility for directing an experimental and theoretical program whose purpose was to evaluate and develop advanced surveillance systems for the Navy. Mr. Rojas also was on the graduate teaching staff at the Pennsylvania State University.

Mr. Rojas' research interests are centered on signal processing and the physics of underwater acoustic propagation, ambient noise, and reverberation.

Mr. Rojas is a member of the Acoustical Society of America, Sigma Xi, the Institute of Electrical and Electronics Engineers, and a charter member of the Marine Technology Society.



Key Personnel

Name	*Title*
Mr. R.R. Rojas	Associate Director of Research for Oceanology
Mr. W. Brundage, Jr.	Special Assistant
Mr. D. Steiger	Head, Shipboard Computing Group
Mr. A.L. Gotthardt	Head, Ship Facility Group
Dr. J.C. Munson	Superintendent, Acoustics Division
Mr. R.J. Bobber	Superintendent, Underwater Sound Reference Division
Dr. V.J. Linnenbom	Superintendent, Ocean Sciences Division
Dr. J.P. Walsh	Superintendent, Ocean Technology Division

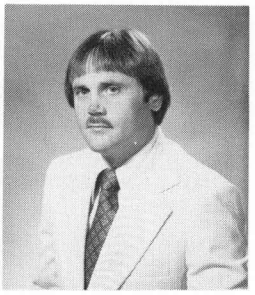
SHIPBOARD COMPUTING GROUP

Basic Responsibilities

The Shipboard Computing Group develops, operates and maintains computer facilities on NRL's research ship, NRL aircraft, and at the Laboratory. The Group assists experimenters in the use of their measuring equipment and the utilization of the computer system in the automatic acquisition, reduction, and processing of their data. The Group performs this work under the Associate Director of Research for Oceanology.

Key Personnel

Name	*Title*
Mr. D. Steiger	Head, Shipboard Computing Group



Mr. D. Steiger

Civilian Personnel

Full-Time Permanent: 6

Total Estimated R&D Funding

Fiscal Year 1977: $225,000

SHIP FACILITY GROUP

Basic Responsibilities

The Ship Facility Group is responsible for coordinating, maintaining, and providing ship services, sea-going facilities, and specialized expertise in the area of navigation, communication, explosives, and deck handling common to and required by the at-sea experiments of Research Divisions under the Associate Director of Research for Oceanology.

Key Personnel

Name	*Title*
Mr. A.L. Gotthardt	Head, Ship Facility Group

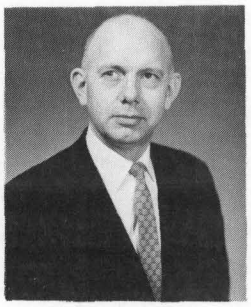
Mr. A. L. Gotthardt

Civilian Personnel

Full-Time Permanent: 15

Total Estimated R&D Funding

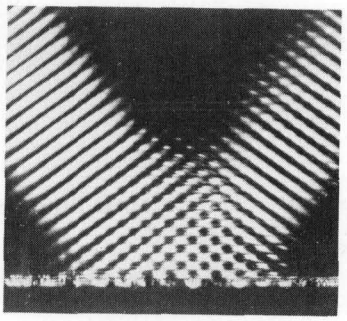
Fiscal Year 1977: $3,400,000



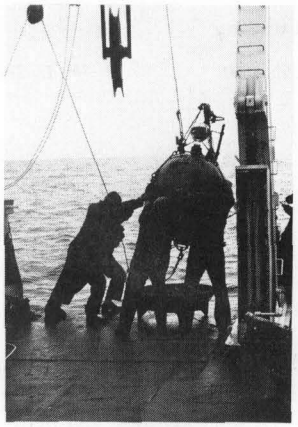
Dr. J. C. Munson

Acoustics Division

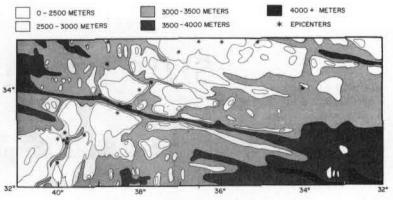
- APPLIED OCEAN ACOUSTICS
- LARGE APERTURE ACOUSTICS
- PHYSICAL ACOUSTICS
- SYSTEMS ENGINEERING



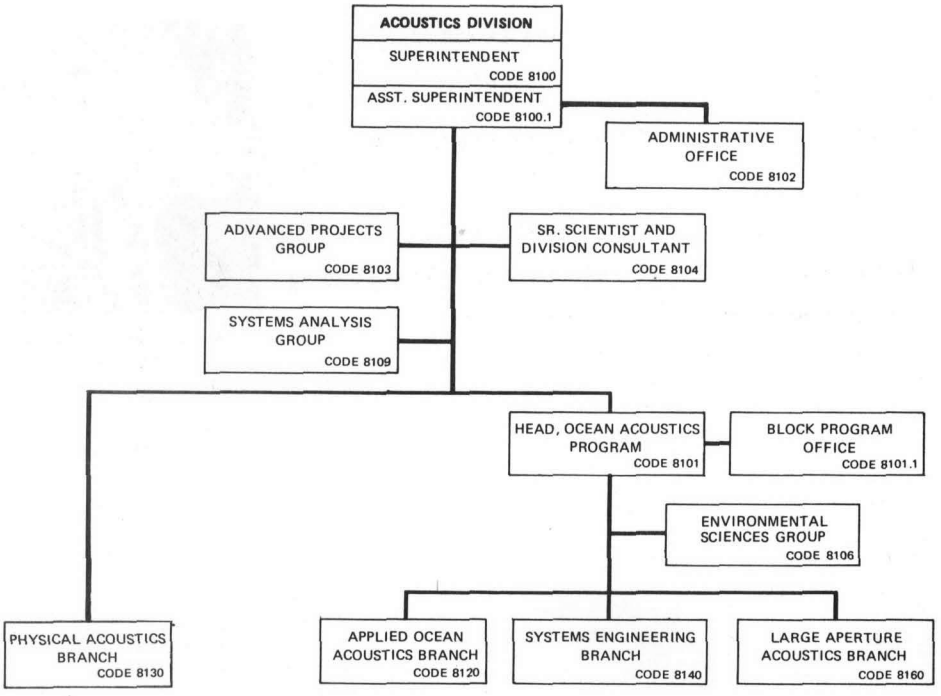
ACOUSTIC FIELD VISUALIZATION WITH SCHLIEREN TECHNIQUES



LAUNCHING EXPERIMENTAL BUOYS



MAP OF HAYES FRACTURE ZONE



Basic Responsibilities

The Acoustics Division has major responsibilities for basic and applied research and development in the Navy's undersea acoustic surveillance programs. The main thrust of the Division program is to measure and model the ocean environment as it pertains to the development and use of acoustic detection and classification systems. Accordingly, the program consists of analyses and model development of long-range propagation, coherency, wave-front behavior, ambient noise, and reverberation in the deep ocean. Special areas of interest include propagation and ambient noise in the Arctic and in acoustically shallow water. Models developed in this program are used in the performance prediction of operational or developmental acoustic detection systems or of proposed system concepts. Other research areas in the Division program include target strength measurement and modeling; diffraction, reflection, and scattering; and the use of acoustical techniques in measuring the thermodynamic properties of materials. The program is both theoretical and experimental and is supported by systems analyses and systems engineering, particularly in support of the extensive at-sea experimental part of the program. The Division interacts with research programs outside the Division and the Laboratory in areas such as materials, transducer development, oceanography, deep-ocean technology, systems analysis, and Fleet operations.

Staff Activities

Environmental Sciences
Research & development to establish geophysical & oceanographic parameters influencing underwater acoustics

System Analysis
Systems studies
Surveillance system concepts and evaluation

Advanced Projects
Advanced surveillance systems
Information processes for underwater acoustics

Branches

Applied Ocean Acoustics
- Shallow-water acoustics
  - Mode analysis
  - Models of signal and noise fields
- Long-range propagation
  - Very low frequency
  - Convergence zone stability
- Arctic underwater acoustics
  - Propagation
  - Noise

Physical Acoustics
- Ultrasonic investigation of liquids and amorphous solids
- Reflection, diffraction, scattering by bodies
- Target strength modeling
- Schlieren visualization
- Fiber optic acoustic sensors

Large Aperture Acoustics
- Propagation, coherency, and wave-front behavior
- Large-scale spatial and temporal integration
- Array deformation
- Ambient noise measurements and modeling
- Low-frequency monostatic and bistatic reverberation

Systems Engineering
- Engineering Research & Development
- Develop/provide equipment for ocean-going program
- Participate in at-sea experiments

Key Personnel

Name	*Title*
Dr. J.C. Munson	Superintendent
Mr. B.G. Hurdle	Assistant Superintendent
Mrs. J.L. Wilkerson	Administrative Officer
Dr. S. Hanish	Senior Scientist and Division Consultant
Mr. W.J. Finney	Head, Advanced Projects Group
Dr. J.C. Munson*	Head, Ocean Acoustics Program
Mr. F.C. Titcomb	Block Program Office
Mr. H.S. Fleming	Head, Environmental Sciences Group
Dr. J.C. Knight	Head, Systems Analysis Group
Mr. R.H. Ferris	Head, Applied Ocean Acoustics Branch
Dr. C.M. Davis, Jr.	Head, Physical Acoustics Branch
Dr. J.C. Munson*	Head, Systems Engineering Branch
Dr. B.B. Adams	Head, Large Aperture Acoustics Branch

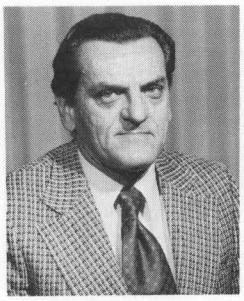
Civilian Personnel

Full-Time Permanent: 106

Total Estimated R&D Funding

Fiscal Year 1977: $8,000,000

*Acting



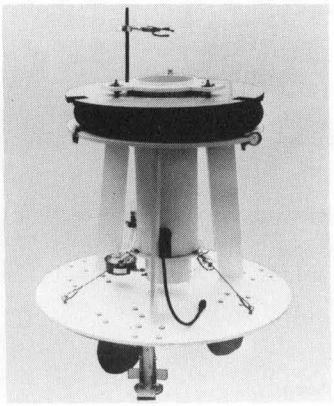
Mr. R. J. Bobber

Underwater Sound Reference Division

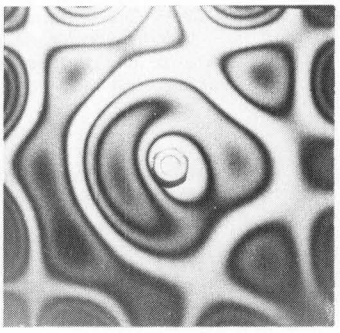
- MEASUREMENTS
- COMPUTER
- STANDARDS
- ELECTRONICS
- SUPPY AND FISCAL
- ENGINEERING SERVICES AND SAFETY

LEESBURG FACILITY-CALIBRATION BARGE

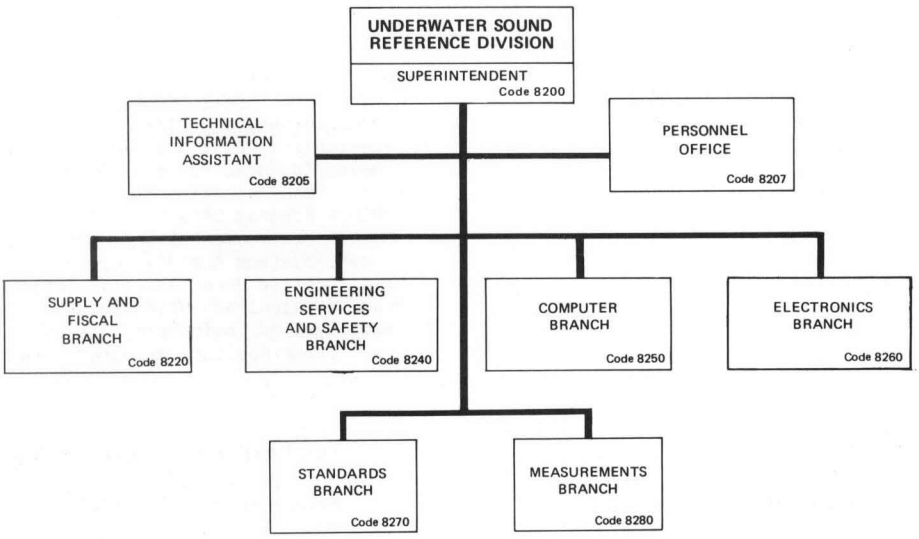
UNDERWATER SOUND REFERENCE DIVISION, ORLANDO, FLORIDA



USRD TYPE G40 SHIPBOARD CALIBRATOR



HOLOGRAM OF VIBRATING TRANSDUCER DIAPHRAGM



Basic Responsibilities

The Underwater Sound Reference Division is the focal point in the Navy for standardization in the science and technology of underwater sound measurements. Its research and development program is aimed at expanding the state of the art and providing Navy in-house expertise. Reference calibration measurements in a large complex of specialized facilities and calibrated standard transducers are available to all naval activities and contractors in support of undersea warfare programs.

Research and Development Branches

Measurements
- Calibration theory and accuracy
- Measurement methods
- Standard calibration services
- Sonar transducer test and evaluation
- Array and radiation theory

Computer
- Computerized data reduction
- Computation services

Standards
- Acoustic materials
- Electroacoustic standards
- Acoustic sources
- Specialized electroacoustic transducers
- Standard loan services
- Transduction research

Electronics
- Digital systems
- Analog systems
- Signal analysis

Key Personnel

Name	*Title*
Mr. R.J. Bobber	Superintendent
Ms. D.A. Pieper	Technical Information Assistant
Mr. V.A. Lombardo	Personnel Officer
Mr. J.C. Michael	Head, Supply and Fiscal Branch
Mr. W.V. Carlson	Head, Engineering Services and Safety Branch
Mr. J.D. George	Head, Computer Branch
Mr. M.O. Rhue	Head, Electronics Branch
Mr. I.D. Grovest	Head, Standards Branch
Dr. J.E. Blue	Head, Measurements Branch

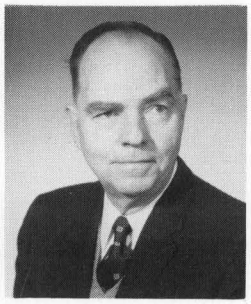
Civilian Personnel

Full-Time Permanent: 89

Total Estimated R&D Funding

Fiscal Year 1977: $2,800,000

†Additional duty as Associate Superintendent

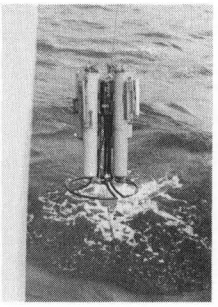


Dr. V. J. Linnenbom

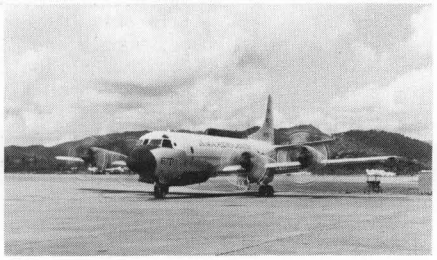
Ocean Sciences Division

- APPLIED OCEANOGRAPHY
- ATMOSPHERIC PHYSICS
- CHEMICAL OCEANOGRAPHY
- PHYSICAL OCEANOGRAPHY
- MARINE BIOLOGY AND BIOCHEMISTRY

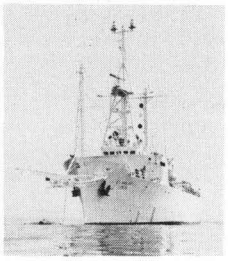
OCEANOGRAPHY

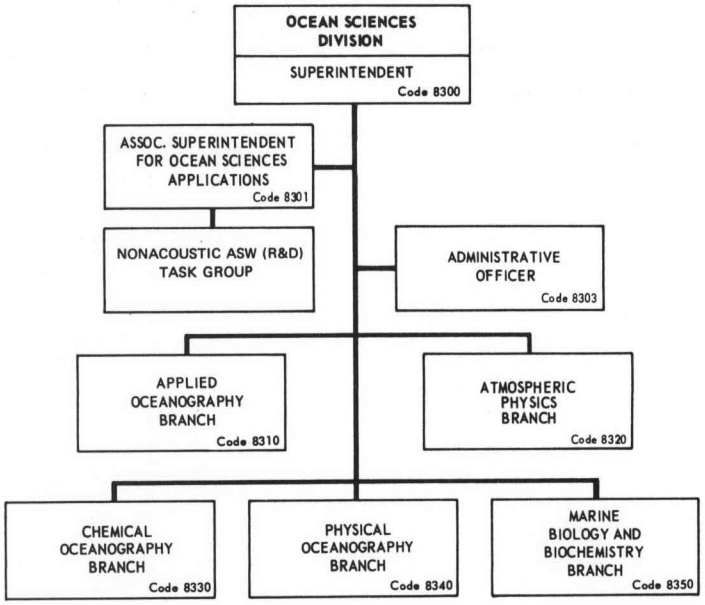


ATMOSPHERIC PHYSICS AND CHEMISTRY



AIR-SEA INTERACTIONS





Basic Responsibilities

The primary responsibility of the Ocean Sciences Division is research on fundamental problems in oceanography and the atmospheric sciences. At present, the Division studies problems in physical, chemical, and biological oceanography and in atmospheric physics to gain a better understanding of the Navy's operational environment. This knowledge is applied to various Navy programs in antisubmarine warfare, protection of the marine environment, protection against biodegradation of naval materials, and prediction of oceanic and atmospheric phenomena affecting naval operations.

Staff Activity

Nonacoustic ASW (R&D) Task Group

Branches

Applied Oceanography
- Antisubmarine warfare
- Hydrodynamics of submerged bodies

Atmospheric Physics
- Marine boundary layer meteorology
- Aerosol and cloud physics
- Atmospheric electricity
- Electro-optics meteorology

Chemical Oceanography
- Physical chemistry of seawater
- Dissolved gases in seawater
- Marine aerosols
- Interface Chemistry

Physical Oceanography
- Ocean dynamics
- Mixed layer studies
- Wave interactions
- Mesoscale variability

Marine Biology & Biochemistry
- Biodegradation of naval materials
- Marine pollution
- Bioluminescence
- Chemosensing

Key Personnel

Name	*Title*
Dr. V.J. Linnenbom	Superintendent
Dr. J.O. Elliot	Associate Superintendent for Ocean Science Applications Director, Nonacoustic ASW (R&D) Task Group
Mrs. R.M. Baltzell	Administrative Officer
Dr. A.H. Schooley	Senior Research Scientist
Dr. J.O. Elliot*	Head, Applied Oceanography Branch
Dr. L.H. Ruhnke	Head, Atmospheric Physics Branch
Dr. C.H. Cheek	Head, Chemical Oceanography Branch
Dr. J.M. Witting	Head, Physical Oceanography Branch
Dr. D.W. Strasburg	Head, Marine Biology and Biochemistry Branch

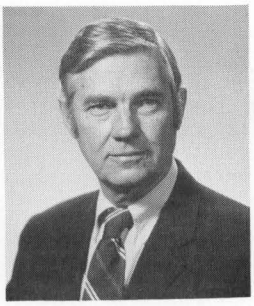
Civilian Personnel

Full-Time Permanent: 70

Total Estimated R&D Funding

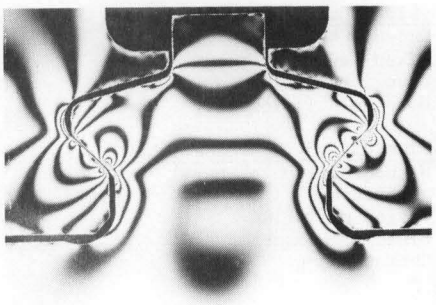
Fiscal Year 1977: $4,500,000

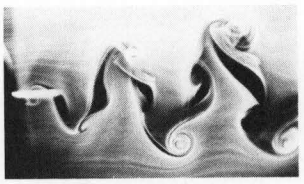
*Acting



Dr. J. P. Walsh

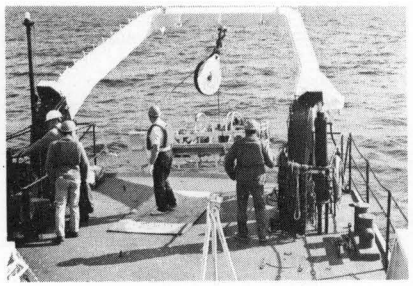
Ocean Technology Division



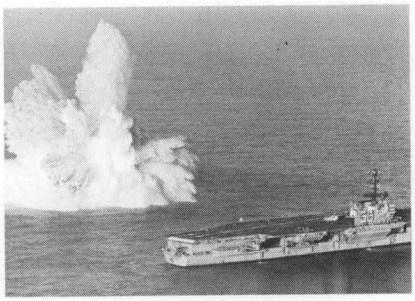


VORTEX SHEDDING FROM A VIBRATING CYLINDER

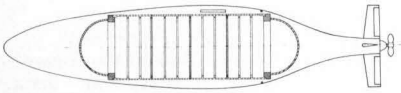
PHOTOELASTIC PATTERN OF THE STRESS DISTRIBUTION IN THE BLADE LUG REGION OF THE THIRD STAGE OF A TURBINE ENGINE



DEEP OCEAN SEARCH SYSTEM

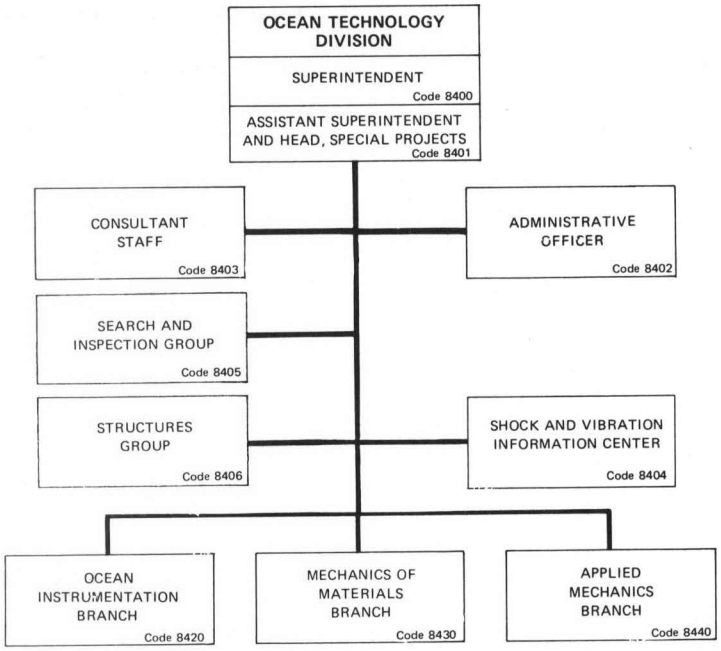


UNDERWATER SHOCK TEST OF AN AIRCRAFT CARRIER



UNDERWATER FREE SWIMMING SUBMERSIBLE

- MECHANICS OF MATERIALS
- OCEAN INSTRUMENTATION
- APPLIED MECHANICS



Basic Responsibilities

The Ocean Technology Division conducts research and development in the following ocean engineering fields: the mechanics of materials in the ocean environment; hydromechanics with emphasis on fluid-structure interactions; structural mechanics; instrumentation, sensors, and robots for use in the ocean; and ocean system design. The Shock and Vibration Information Center provides a source of information on shock and vibration for engineers nationwide.

Staff Activities

S&V Information Center
Search and Inspection Group
Structures Group

Branches

Applied Mechanics
- Shipboard shock fundamentals
- Shock protection for weapons systems
- Methods for design against shock
- Fracture mechanics design studies
- Developmental studies of prototypes
- Shock strength of materials
- Hydromechanic studies

Mechanics of Materials
- Fracture mechanics and fracture strength
- Plastic flowing
- Compression failure mechanisms
- Armor research and development
- Deep submergence materials/structures
- Missile component failure
- Nondestructive testing

Ocean Instrumentation
- Instrumentation analysis, research and development
- Sensors, detectors
- Data and signal processing
- Stress and kinematic quantities measurement

Key Personnel

Name	*Title*
Dr. J.P. Walsh	Superintendent
Dr. R.T. Swim*	Assistant Superintendent
Mrs. A.G. Branham	Administrative Officer
Mr. H.C. Pusey	Head, S&V Information Center
Mr. G.O. Thomas	Head, Search and Inspection Group
Mr. G.J. O'Hara	Head, Structures Group
Mr. H.A. Johnson	Head, Ocean Instrumentation Branch
Dr. J.M. Krafft	Head, Mechanics of Materials Branch
Dr. F. Rosenthal	Head, Applied Mechanics Branch

Civilian Personnel

Full-Time Permanent: 66
Military: 42

Total Estimated R&D Funding

Fiscal Year 1977: $5,900,000

*Acting

The Support Services Department

The Director of Support Services is a Navy Captain with appropriate training and experience; he reports to the Commanding Officer of NRL. His primary responsibility is the supervision, coordination, and control of the administrative and service operations required in support of the work of the Research Department. Usually, he is the next senior officer to the Commanding Officer and assumes the responsibilities of and acts for the Commanding Officer in his absence.

The Director of Support Services is responsible for:

guiding and coordinating the service divisions of the Laboratory (Engineering Services, Supply, Public Works, Technical Information, and Chesapeake Bay) and also his staff functions (Safety Office and Patent Counsel) so that services rendered are adequate, prompt, accurate, and economical in the use of men and money.

exercising, for the Commanding Officer of NRL, approval authority for the NRL directives system, assuring that interests of all concerned components are taken into account, that staff work is complete, and that implementation is in a manner appropriate to the research environment.

being familiar with the scientific program and for following the progress of the scientific efforts of the Laboratory in sufficient detail to ensure that administrative decisions are made which support the scientific program.

assisting the Commanding Officer of NRL in maintaining overall short- and long-range organization plans for the support areas to best serve and advance the research mission. Advising on and participating in allocation of resources to meet support services mission and support research.

keeping the Commanding Officer of NRL advised of matters requiring his attention, decision, or other action; acting for the Commanding Officer of NRL in the approval of routine matters; for assisting the Commanding Officer of NRL generally with administrative detail, correspondence, reports, and similar matters.

issuing NRL directives and procedures for the Commanding Officer.

The Director of Support Services keeps in constant touch with the Director of Research to ensure that the service units of the Laboratory are providing complete support to the scientific divisions. He coordinates with the Director of Research in the planning and carrying out of administrative actions affecting Research Department organization and personnel; and he maintains a close working relationship with the Chief Staff Officer and officers assigned to him to assure provision of support services in operations conducted by the Chief Staff Officer. He also has direct "line" authority over the heads of special staff and service divisions of the Support Services Department.

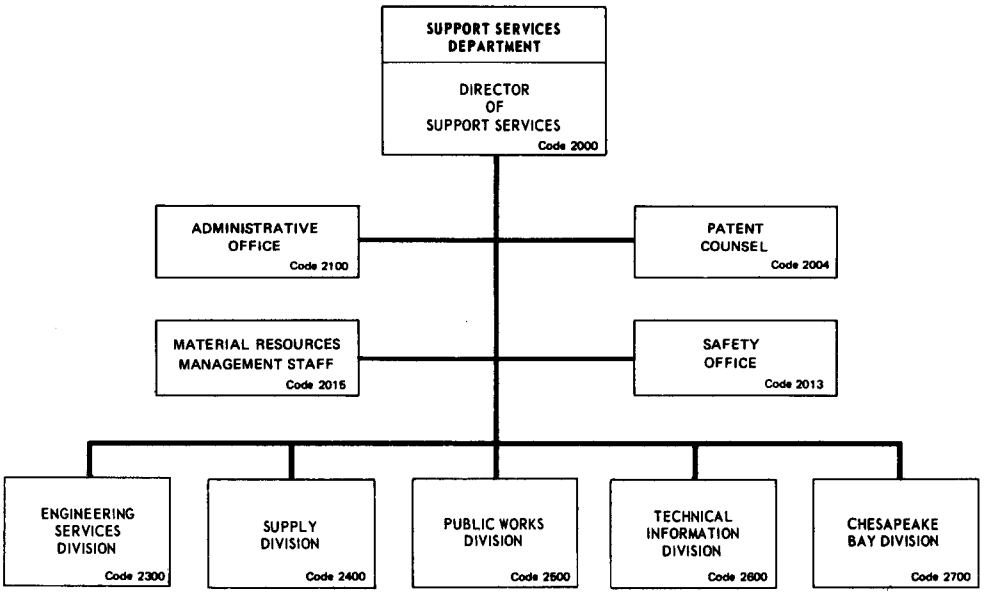
Director, Support Services

Captain Kenneth P. Hughes

CAPTAIN KENNETH P. HUGHES, [redacted] is a 1953 graduate of the U.S. Naval Academy. He was also graduated from the U.S. Naval Postgraduate School, Ordnance Engineering Curriculum. In addition, he is a graduate of the Industrial College of the Armed Forces, Class of 1976.

CAPTAIN HUGHES served successive tours on the USS O'HARE (DDR-889), USS DONNER (LSD-20), and as Aide and Flag Lieutenant to Commander Amphibious Group Four. After Postgraduate School he served as Commanding Officer, USS LUISENO (AFT-156), and as Executive Officer on the USS STEINAKER (DD-863). His other assignments included a tour with the Undersea Directorate, Naval Ordnance Systems Command; as Commander, Task Group 115.3; as Senior Advisor, Third Coastal Zone, Vung Tau, Vietnam; and as Assistant to Commander, Anti-Submarine Warfare Projects for Test and Evaluation. CAPTAIN HUGHES was designated for Ordnance Engineering Duty in 1970 and for Engineering Duty in 1974. He assumed the position of Director of Support Services at NRL on 21 June 1976.

CAPTAIN HUGHES is married to the former Peggy J. Seawell of Norfolk, Virginia; they have one daughter.



Key Personnel

Name	*Title*	*Code*
CAPT K.P. Hughes, USN	Director of Support Services	2000
Dr. P. Schneider	Patent Counsel	2004
Mr. H.C. Kennedy, Jr.	Safety Officer	2013
Mr. P.C. Buck*	Head, Material Resources Management Staff	2015
Mr. J. Cooper	Head, Administrative Office	2100
CDR A. P. Amesse, USN	Engineering Services Officer	2300
CDR R.W. Gunther, SC, USN	Supply Officer	2400
CDR V. Podbielski, CEC, USN	Public Works Officer	2500
Mr. E.E. Kirkbride	Head, Technical Information Division	2600
CDR B.A. Bauer	Chesapeake Bay Division Officer	2700

*Acting

OFFICE OF PATENT COUNSEL

Basic Responsibilities

The Office of Patent Counsel provides services concerning inventions, patents, trademarks, copyrights, and other related matters. Patent applications are prepared, filed, and prosecuted on NRL inventions of significance to the Government. The Patent Counsel serves as consultant and adviser on patent and data clauses in R&D and procurement contracts, claims of patent or copyright infringement involving NRL, and the provisions in interagency agreements relating to inventions, patents, trademarks, copyrights, and related matters. Assistance is provided the Research Department through state-of-the-art searches in the patent literature pertinent to particular research problems.

Key Personnel

Name	*Title*
Dr. P. Schneider	Patent Counsel

Civilian Personnel

Full-Time Permanent: 9

Dr. P. Schneider

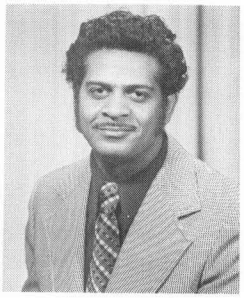
ADMINISTRATIVE OFFICE

Basic Responsibilities

The Administrative Office provides staff support to administrative officials of the Laboratory in the areas of Travel Management, Records and Correspondence Management, Files Management, Mail and Messenger service, Forms Management, Design and Analysis, Report Management Analysis and Control, and Directives Management for all components of the Laboratory. The office also provides for the NRL Code Directory control, the administration of the Laboratory parking facilities, and management of the Administrative Paperwork Reduction Program. In addition, the office conducts direct routine administrative correspondence with other units of the Navy, DOD, and other governmental and civilian agencies.

Key Personnel

Name	*Title*
Mr. J. Cooper	Head, Administrative Office
Mrs. C. Schmitt	Administrative Officer
Mrs. T.R. Wilder	Head, Travel Branch
Mrs. L.V. Dabney	Head, Records and Correspondence Management Branch
Mr. O.L. Scott	Head, Mail and Messenger Branch



Mr. J. Cooper

Civilian Personnel

Full-Time Permanent: 27

SAFETY OFFICE

Basic Responsibilities

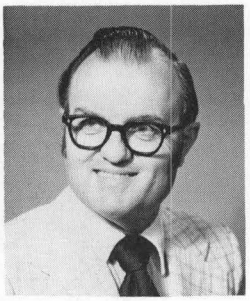
The Safety Office administers the Laboratory's safety and health program except in the fields of microwave and radiological safety. Its responsibilities include inspection, training, and education. It also conducts accident investigations, prepares directives, provides accident prevention information, directs the activities of Safety Representatives and Committees, reviews hazardous experiments, and guides management in matters of safety. Other activities include JAG investigations and waste-chemical disposal.

Key Personnel

Name	*Title*
Mr. H.C. Kennedy, Jr.	Head, Safety Office

Civilian Personnel

Full-Time Permanent: 4



Mr. H. C. Kennedy, Jr.

MATERIAL RESOURCES MANAGEMENT STAFF

Basic Responsibilities

The Material Resources Management Staff is responsible for the effective management of interior spaces and certain types of equipment such as loan pool items, labor-saving devices and minor property.

Key Personnel

Name	*Title*
Mr. P.C. Buck*	Head, Material Resources Management Staff

Civilian Personnel

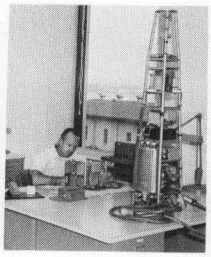
Full-Time Permanent: 1

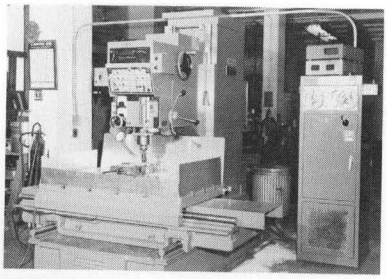
Mr. P. C. Buck

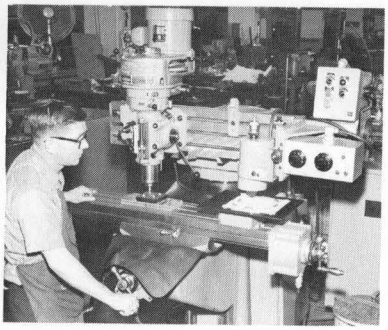
*Acting

CDR A. P. Amesse, USN

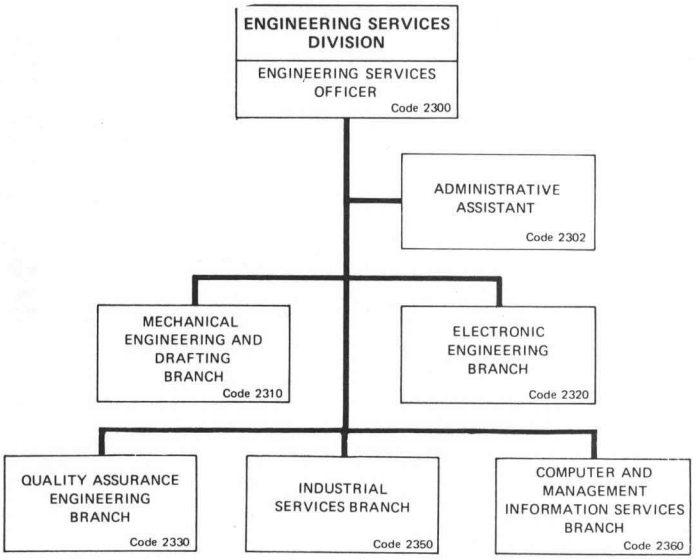
Engineering Services Division







- MECHANICAL ENGINEERING AND DRAFTING
- ELECTRONIC ENGINEERING
- QUALITY ASSURANCE ENGINEERING
- INDUSTRIAL SERVICES
- COMPUTER AND MANAGEMENT INFORMATION SERVICES



Basic Responsibilities

The Engineering Services Division provides the engineering, design, fabrication, assembly, and test of experimental research equipment in support of the Laboratory's research efforts.

Key Personnel

Name	*Title*
CDR A.P. Amesse, USN	Engineering Services Officer
Mrs. A. Cox	Administrative Officer
Mr. M.A. Shimkus	Head, Mechanical Engineering and Drafting Branch
Mr. J.J. Brotzman	Head, Electronic Engineering Branch
Mr. P.C. Buck	Head, Quality Assurance Engineering Branch
Mr. J.L. Leizear	Head, Industrial Services Branch
Mr. L.G. Murphy	Head, Computer and Management Information Services Branch

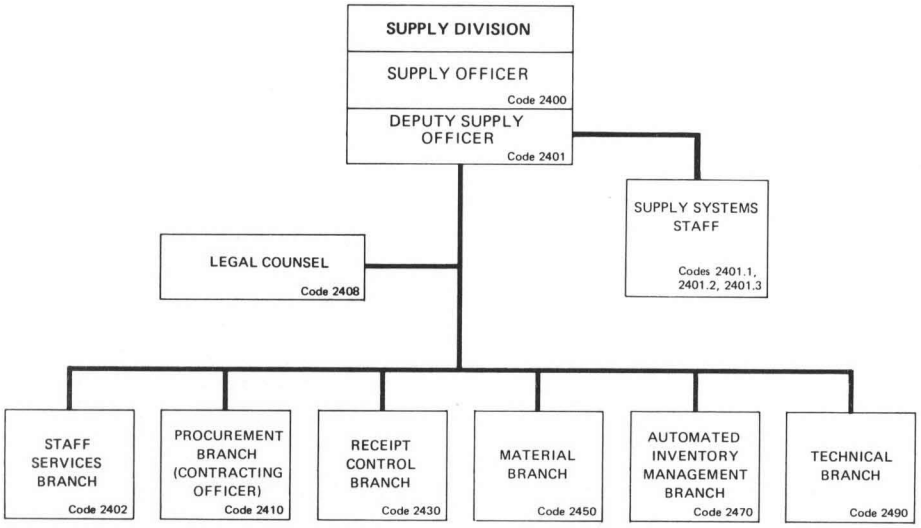
Civilian Personnel

Full-Time Permanent: 278
Military: 1

CDR R. W. Gunther

Supply Division

- STAFF SERVICES
- AUTOMATED INVENTORY MGT. SYSTEM
- PROCUREMENT
- RECEIPT CONTROL
- MATERIAL
- TECHNICAL



Basic Responsibilities

The Supply Division provides service functions to the Laboratory and its field activities, including the operation of Supply issue stores; procurement of equipment, material, and contractual services; receipt, inspection, and delivery of material and equipment; packing, shipping, and traffic management; and survey and disposal of excess and unusable property.

In addition, Supply offers technical and counseling services to the Research Departments, in the development of specifications for a complete procurement package; consultation as needed in the handling of claims against the Laboratory, guidance in the performance stages of contractual services, and material transportation services.

During FY 1976 the Supply Division occupied 14,924 m^2 (160,641 sq. ft.) of building space; its stores (six retail and one bulk warehouse) inventory averaged $1,771,705; stores issues totalled $2,350,000; and the Procurement Branch processed 51,350 procurement documents totaling $55,700,000 on the open market with an additional 6950 documents totaling $51,700,000 to other Government organizations for a grand total of 58,300 documents totaling $107,400,000.

Key Personnel

Name	*Title*
CDR R.W. Gunther, SC, USN	Supply Officer
Mr. R.S. Sylvest	Deputy Supply Officer
Atty. A.S. Horton	Legal Counsel
Mr. A.W. Medley, Sr.	Head, Staff Services Branch
Mr. J.K. Walmer	Head, Automated Inventory Management Branch
LT J.E. Culver	Head, Procurement Branch
Mrs. V.S. Thomas	Head, Receipt Control Branch
Mr. H.D. Thompson	Head, Material Branch
Mr. A.E. Dean	Head, Technical Branch

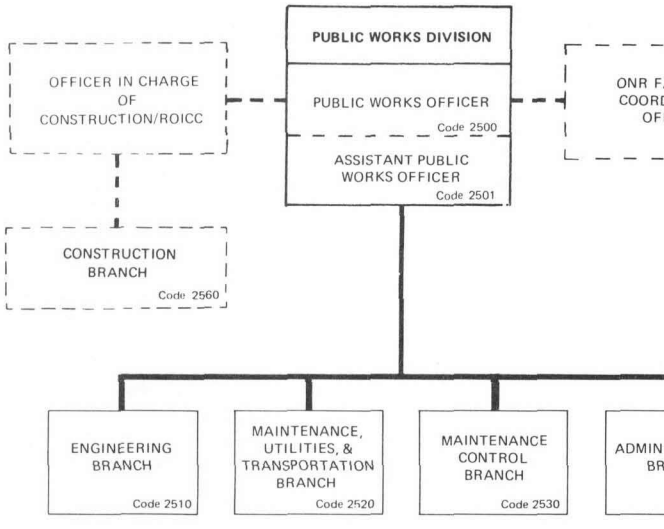
Civilian Personnel

Full-Time Permanent: 146
Millitary: 2

CDR Victor Podbielski, CEC, USN

Public Works Division

- ENGINEERING
- MAINTENANCE, UTILITIES, AND TRANSPORTATION
- MAINTENANCE CONTROL
- ADMINISTRATION
- CONSTRUCTION



Basic Responsibilities

The Public Works Division is responsible for the physical plant of NRL. This includes: (a) responsibility for the design, construction, maintenance, and repair of public works and utilities; (b) reponsibility for the operation of these public works and utilities in accordance with the technical standards of the Naval Facilities Engineering Command; and (c) supporting the scientific program of the Laboratory by the construction, repair, and alteration of experimental and test equipment. In addition, the Division obtains required approvals for work for which the Division is responsible from CHESDIV of the Naval Facilities Engineering Command; the Office of Naval Research; the Secretary of the Navy; and other authorities as appropriate.

The Public Works Division also supports the Office of Naval Research for Facilities Coordination and supports the Officer in Charge of Construction/Resident Officer in Charge of Construction on all Naval Facilities Engineering Command and certain research and development contracts at NRL.

Key Personnel

Name	*Title*
CDR V. Podbielski, CEC, USN	Public Works Officer/Officer in Charge of Construction/ROICC/ONR Facilities Coordination Officer
LT. R.A. Elliot	Assistant Public Works Officer
Mr. J.R. Lescault	Head, Administrative Branch
Mr. J.E. Browne*	Head, Engineering Branch
Mr. L.P. Carpenter	Head, Maintenance, Utilities, & Transportation Branch
Mr. R.O. Weidman	Head, Maintenance Control Branch
Mr. J.B. Canha	Head, Construction Branch

Civilian Personnel

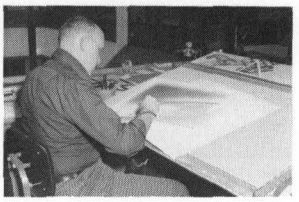
Full-Time Permanent: 379
Military: 2

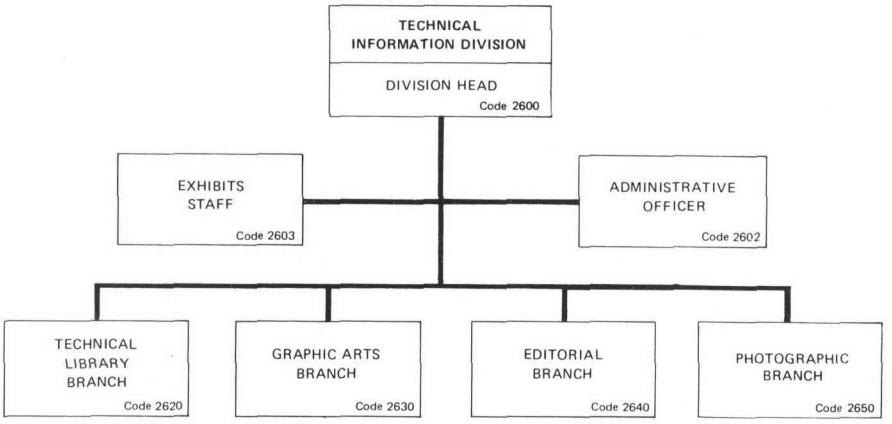
*Acting

Mr. E. E. Kirkbride

Technical Information Division

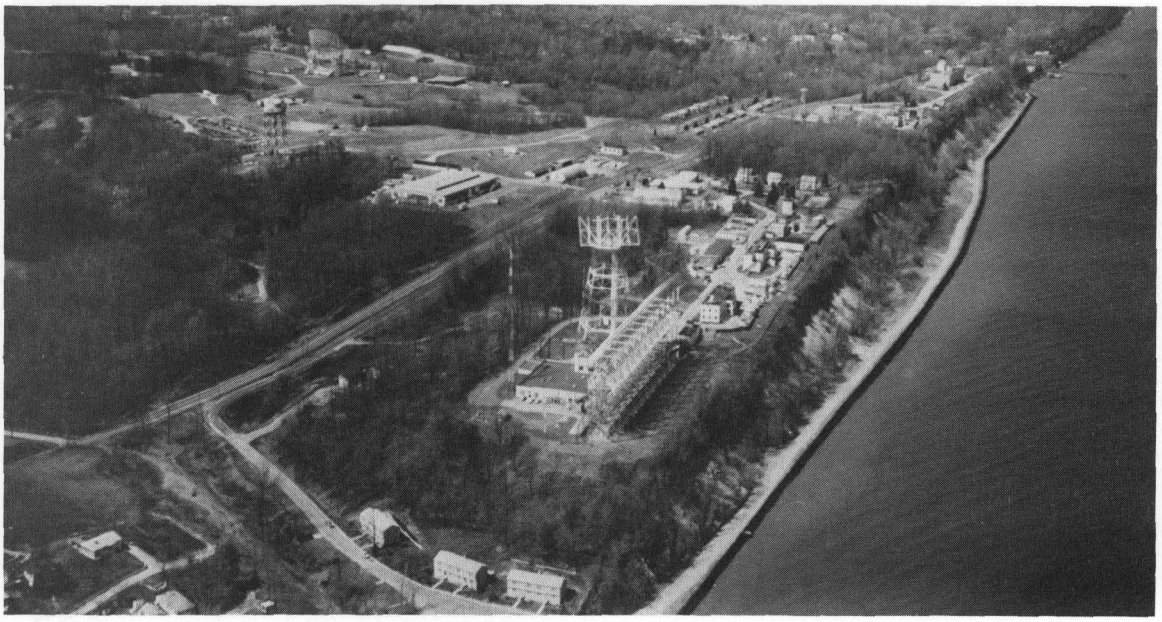
- EDITORIAL
- LIBRARY
- GRAPHIC ARTS
- PHOTOGRAPHIC

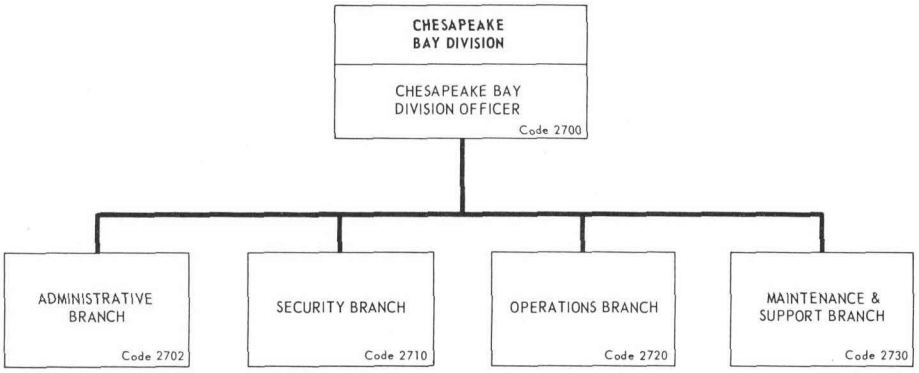




CDR Bruce Bauer

Chesapeake Bay Division





Basic Responsibilities

The Technical Information Division plans and administers the Laboratory's program of preparing and disseminating the results of scientific research through official publications, scientific journals, presentations, films, and exhibits. It provides centralized professional services to both NRL and ONR in writing, editing, printing, exhibits, photography, graphic arts, documentation, and language translations. It operates one of the Navy's largest integrated technical libraries with holdings of 202,000 bound volumes and 400,000 technical reports.

Key Personnel

Name	*Title*
Mr. E.E. Kirkbride	Head, Technical Information Division
Mrs. D.E. Cameron	Administrative Officer
Mr. H. Poole	Head, Exhibits Staff
Mrs. D.P. Baster	Librarian
Mr. D. Darr	Head, Graphic Arts Branch
Mr. S.R. Smith	Head, Editorial Branch
Mr. J. Otto	Head, Photographic Branch

Civilian Personnel

Full-Time Permanent: 123

Basic Responsibilities

The Chesapeake Bay Division operates and maintains shops, plant facilities, and equipment in support of the variety of NRL research and development projects which can best be carried out there.

The Physical Plant

Located in a relatively clear area away from any congestion or industrial interference, the main site, at Chesapeake Beach, covers 68.8 hectares (170 acres) containing 200 structures of various sizes and construction, six of which are major laboratory buildings. There is over 61 m (200 ft.) of usable dock space with a controlling water depth of 2.1 m (7 ft.), located 3.2 km (2 mi.) north of the main site. Off-site facilities include the Tilghman Island Facility, located directly across the Bay from CBD at a range of 16 km (10 mi.).

Research watercraft available at CBD include one 19-m (63-ft.) catamaran, one 17-m (56-ft.) landing craft, one Jack-up-Barge, and one 11-m (36-ft.) motor boat. These are used in support of reseach projects and for transportation between off-site facilities.

Key Personnel

Name	*Title*
CDR B.A. Bauer, USN	Division Officer
Mr. R.M. Conlyn	Station Engineer
Mrs. M.J. Hamor	Administrative Officer
Mr. W.S. Kratz	Security Officer
BMC L. Williams, USN	Operations Officer

Research Division Representatives

Optical Sciences Division

Mr. T.H. Cosden, Field Experiments Representative

Radar Division

Mr. M.W. Lehman, Radar Division Representative
Mr. P.D. Ward, Target Characteristics Branch
Mr. M.C. Licitra, Search Radar Branch
Mr. D. Rohlfs, Radar Techniques Branch

Tactical Electronic Warfare Division

Mr. V.J. Kutsch, Tactical Electronic Warfare Division Representative

Space Systems Division

Mr. P.T. Boltz, Impact Vulnerability Staff Representative

Tenant

Naval Intelligence Support Center

Mr. J.A. Sydow, Navy Foreign Material Exploitation Program

Civilian Personnel

Full-Time Permanent: 63
Military: 2

Awards Received by Civilian Employees

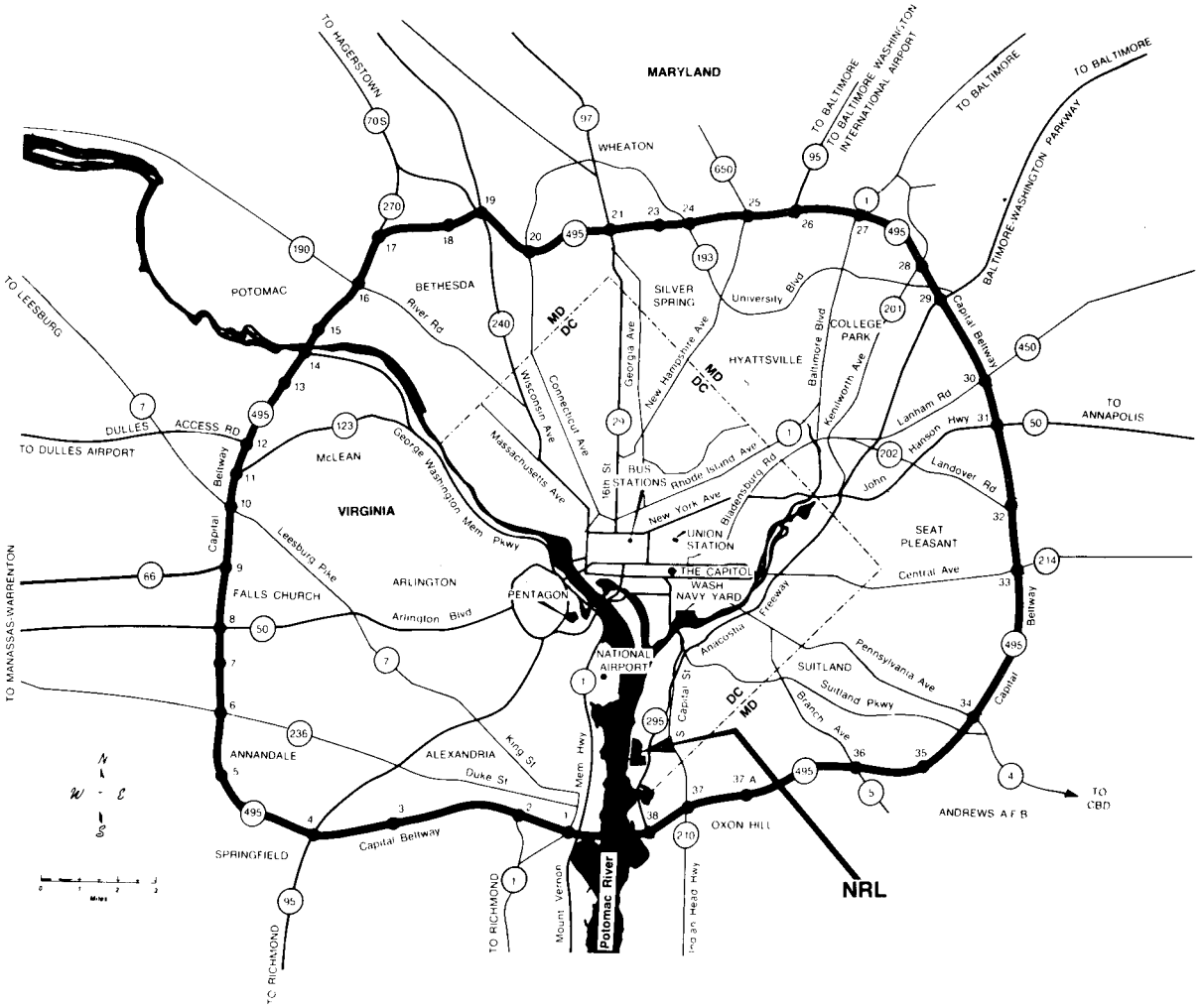
As of December 31, 1977

Government Awards	Number
Chair of Science Award (local NRL Award)	4
Department of Defense Certificate of Merit	1
Department of Defense Distinguished Civilian Service Award	6
E.O. Hulburt Annual Science Award (local NRL Award)	22
Federal Woman's Award	1
NASA Scientific Achievement Medal	1
National Medal of Science from the President of the United States	1
Navy Award for Distinguished Achievement in Science	5
Navy Captain Robert Dexter Conrad Award	7
Navy Distinguished Civilian Service Award	63
Navy Meritorious Civilian Service Award	219
Navy Superior Civilian Service Award	46
Secretary of the Navy Environmental Protection Award	1
The Certificate of Merit from the President of the United States	11
The Medal of Merit from the President of the United States	1
The President's Award for Distinguished Federal Civilian Service	2

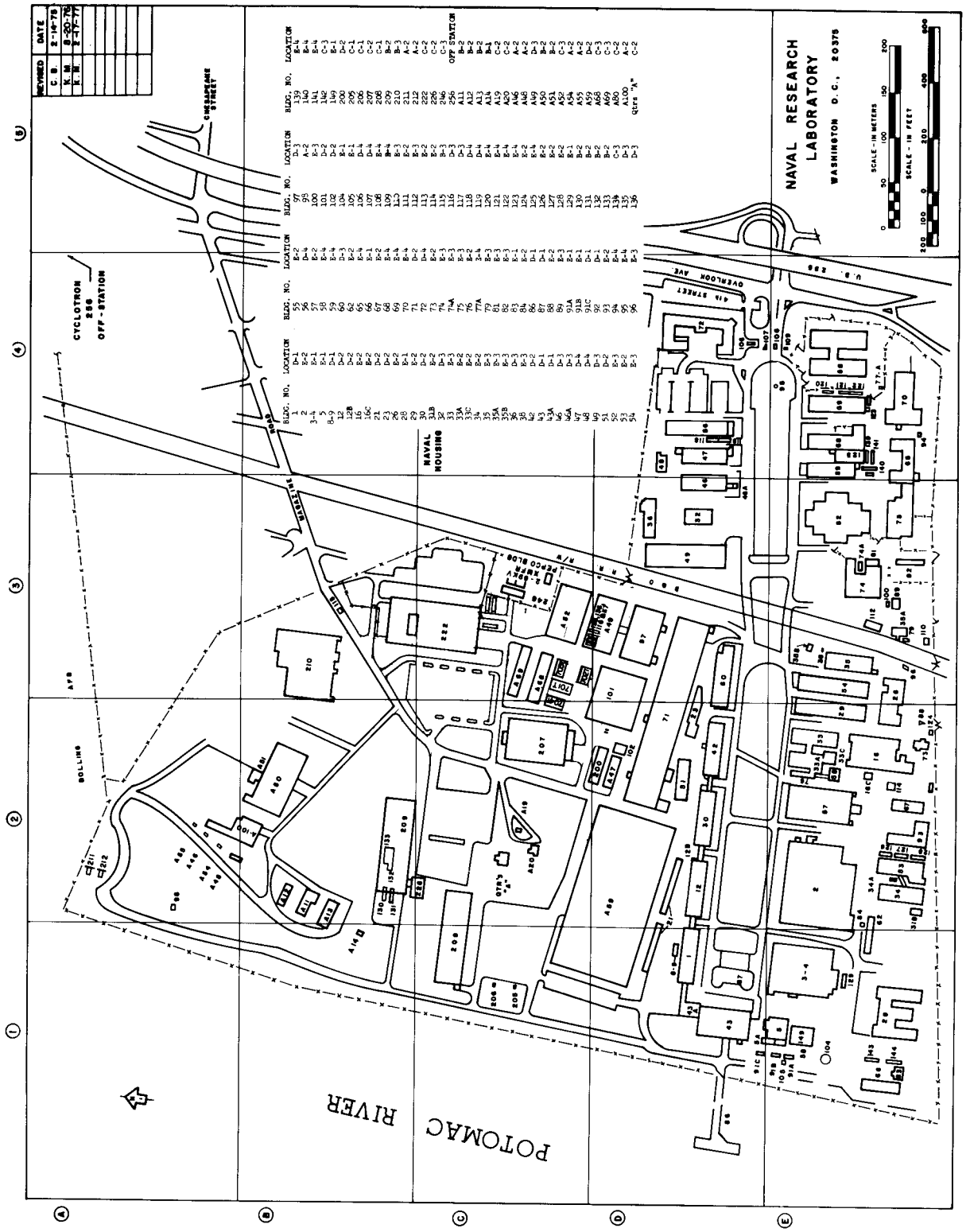
Nongovernment Awards	
A.G. Bissell Memorial Award of the American Welding Society	1
A.K. Doolittle Award of the American Chemical Society	1
Albert A. Michelson Award of the Franklin Institute	1
Albert Sauveur Achievement Award	1
American Nuclear Society Special Award	1
Ancel Prize of the French Photographic Society	1
Annual Award of the Society for Applied Spectroscopy	2
Applied Science Award of Sigma Xi	26
Arthur S. Fleming Award of the Washington Chamber of Commerce	5
Award in the Chemistry of Plastics & Coatings of the American Chemical Society	1
Award of Merit of the Society of Technical Writers and Publishers - Washington, D.C. Chapter	1
Award of Merit of the American Society for Testing and Materials	3
Brazilian Legion of Naval Merit	1
Burgess Memorial Award of the American Society for Metals	4
Burgess Memorial Lecture of the American Society for Metals (Washington Section)	1
Burgess Prize Award of the American Society for Metals	2
Charles B. Dudley Medal of the American Society for Testing Materials	4
District Meritorious Certificate Award of the American Welding Society	1
Dryden Research Award of the American Institute of Aeronautics and Astronautics	1
E. Edward Pendray Award of the American Rocket Society	1
Eddington Medal of the Royal Astronomical Society (Great Britain)	2
Engineers and Architects Day Award	4
Engineering Science Award of the Washington Academy of Sciences	2
Frank Booth Award - International Power Sources Symposium	1
Frederic Ives Award of the Optical Society of America	2
Garvan Medal of the American Chemical Society	1
Gold Medal Award of the American Society of Naval Engineers	2
Harry Diamond Award of the Institute of Radio Engineers	4
Henry Draper Medal of the National Academy of Sciences	1
Hillebrand Prize of the American Chemical Society	4
Irwin Vigness Award of the Institute of Environmental Sciences	1
James H. Wyld Memorial Award of the American Rocket Society	1
Janssen Medal of the French Photographic Society	1
John Adam Fleming Award of the American Geophysical Union of the National Academy of Sciences - National Research Council	1
John A. Penton Gold Medal of the American Foundrymen's Society	1
John Scott Medal of the City of Philadelphiia	1
Joseph S. Seaman Gold Medal Award of the American Foundrymen's Society	1
Kendall Company Award of the American Chemical Society	1
Kratel Award of the Eurocontamination Foundation	1
M. Barry Carlton Award Institute of Electrical & Electronics Engineers	1
Marcus A. Grossman Award of the American Society of Metals	2
Mayo D. Hersey Award of the American Society of Mechanical Engineers	1
Medal of Honor Award of the Institute of Radio Engineers	2
Merit Award of Carnegie-Mellon University	1
Morris Liebman Memorial Prize of the Institute of Radio Engineers	1

Non-Government Awards (Continued)	Number
National Academy of Sciences, elected members	3
National Capital Award of the D.C. Council of Engineering and Architectural Studies	3
National Civil Service League Career Service Award	1
National Award of the American Society of Lubrication Engineers	1
Notre Dame Centennial Award	2
Outstanding Americans Foundation Award	1
Patrons Award of the Institute of Radio Engineers	2
Physical Science Award of the Washington Academy of Sciences	5
Pittsburgh Spectroscopy Award of the Spectroscopy Society of Pittsburgh	1
Professional Achievement Award of the D.C. Council of Engineering and Architectural Societies	1
Progress Award of the Photographic Society of America	1
Pure Science Award of Sigma Xi	26
Reliability and Quality Control Award of the Radio Engineers Professional Group	2
Rockefeller Public Service Award	1
Sam Tour Award of the American Society for Testing and Materials	2
Scientific Achievement Award of the Washington Academy of Sciences	1
Service Award of the Chemical Society of Washington	1
Service to Mankind Award of the Washington Sertoma Club	1
Society of Technical Writers & Publishers - Washington, D.C. Chapter	1
Society of Women Engineers Achievement Award	1
Space Science Award of the American Institute of Aeronautics & Astronautics	1
Stuart Ballantine Medal of the Franklin Institute of Pennsylvania	2
Technical Achievement Award of the American Society of Mechanical Engineers	1
Trent - Credo Award of the Acoustical Society of America	1
United Negro College Fund Distinguished Service Citation	1
Victor K. LaMer Award of the Colloid and Surface Chemistry Division, American Chemical Society	1
William Blum Award of the Washington-Baltimore Electrochemical Society	5
William Hunt Eisenman Medal of the American Society for Metals	1

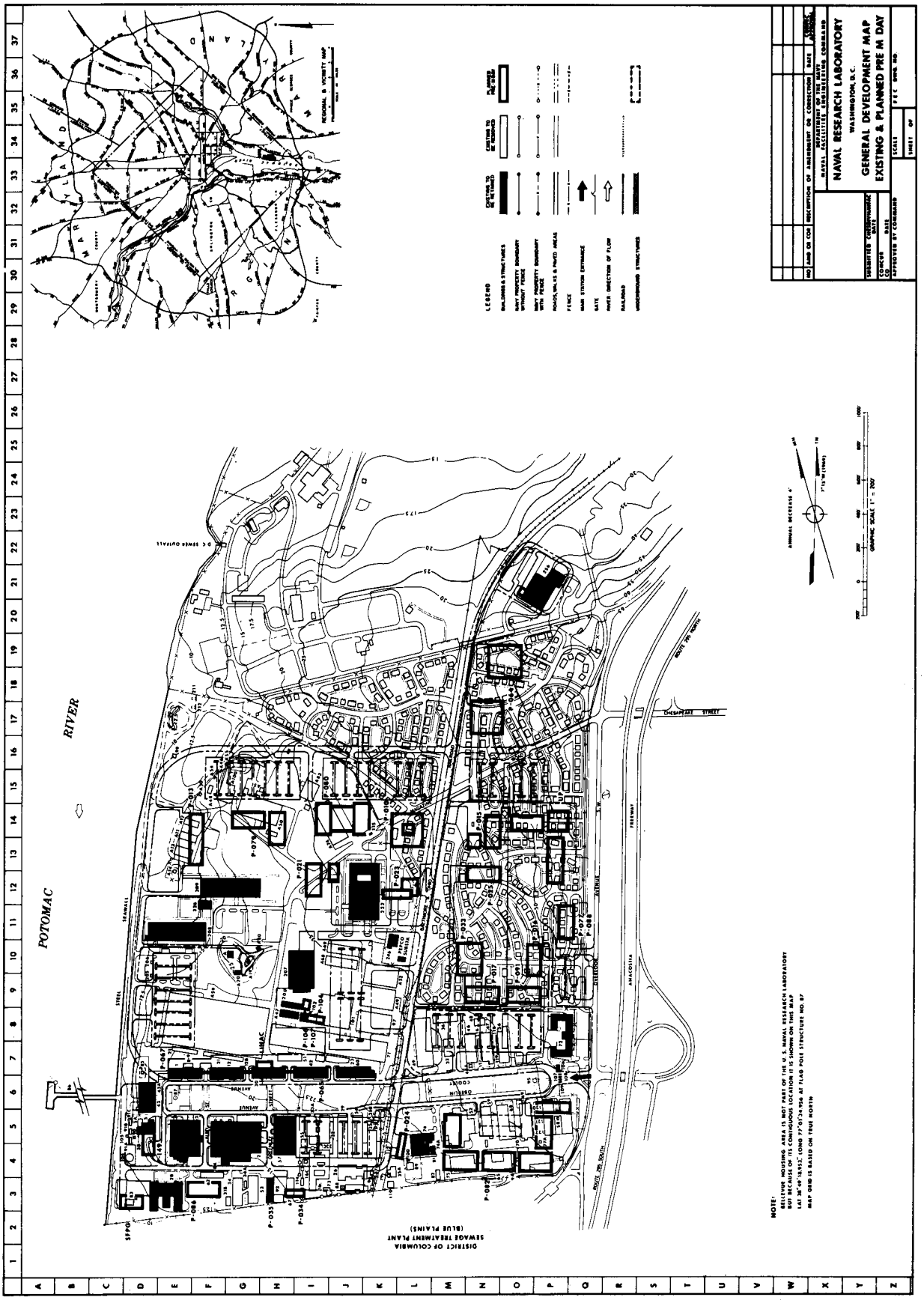
Location of NRL



Location of Buildings at Main Site



General Development Plan



Location of Principal Field Stations

The Underwater Sound Reference Division is located at Orlando, Fla.